

I.—GENERAL ; PLANT ; MACHINERY.

PATENTS.

Rod mills for crushing ores and the like. K. P. Lund, Sultjelma, Norway. Eng. Pat. 113,097, 28.1.18. (Appl. 1646/18.) Int. Conv., 31.1.17.

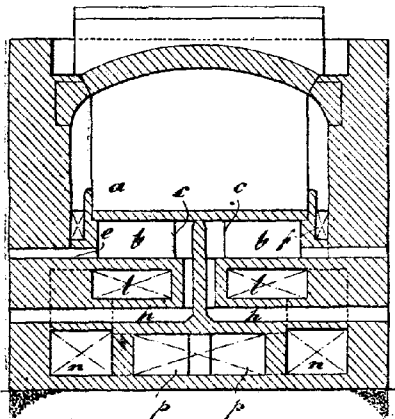
In a crushing mill of the type comprising a truncated conical drum, carrying loose crushing bars, the bars are also made of truncated conical shape with the smaller ends turned in the direction of the flow of material through the mill. The heavy ends are thus utilised for crushing the large-sized ore fed into the mill. The bars taper less than the casing, the difference in taper being such that during the operation of the mill, the axes of the crushing bars, if projected, would meet approximately at the apex of the conical casing.—C. A. K.

Furnaces [; Rotary —]. A. M. Aubert, Billancourt, France. Eng. Pat. 115,840, 3.5.18. (Appl. 7473/18.) Int. Conv., 12.5.17.

THE two parts of a rotating furnace which move relatively to one another are separated longitudinally by a comparatively large gap across which the flame passes without admixture of air from one part to the other. The flame may be observed through the gap and any liquefied material may escape without obstructing the relative movement of the two parts. The mouth of the part into which the flame passes across the gap may be made conical, or its section may be of larger diameter to ensure any required proportion of air being drawn in.—W. F. F.

Furnaces. A. Smallwood, London. Eng. Pat. 120,259, 2.11.17. (Appl. 15,974/17.)

A FURNACE, *a*, heated by gaseous or liquid fuel, is provided with a number of transverse chambers, *b*, below it on both sides, and each chamber is divided into three compartments by vertical partitions, *c*, extending from the outer end nearly to the inner end as shown. The ports, *e*, receive the hot products from Bunsen burners, and lead into the central compartments of the chambers, *b*. The hot gases then pass through the two side compartments



of each chamber, *b*, to the passages, *f*, and thence into the furnace, *a*. Secondary air is supplied to the partly burnt gases by the passages, *h*, leading to the inner ends of the chambers, *b*. The waste gases from the furnace, *a*, pass downwards by passages at one end into the longitudinal flues, *l*, and thence from the further ends of these into

longitudinal flues, *n*, and finally back again through the flues, *p*, to the outlet. The secondary air in the passages, *h*, is thereby preheated. The temperature in the furnace, *a*, may be regulated by providing outlets communicating directly with the stack.—W. F. F.

Furnaces. H. Batchelor, Boston, Mass., U.S.A. Eng. Pat. 120,522, 17.5.18. (Appl. 8285/18.)

An air compressor driven by an electric motor delivers air to a reservoir and thence through a pipe in the top of the furnace. The pipe then branches into two parts which feed the preheated air to two rotary fans mounted on the same shaft, and carrying between them a rotary feeding device at the bottom of a hopper containing powdered fuel. The fuel is thus fed continuously into a mixing chamber to which the air also passes, and the mixture then enters the bottom of the combustion chamber of the furnace. An adjustable friction device is provided on the shaft carrying the feeding device so as to vary its speed and consequently the proportions of fuel and air delivered. The device may be graduated to regulate the proportions according to the amount of carbon and hydrogen in the fuel. The mixture of fuel and air impinges on an incandescent mass of broken refractory material in the combustion chamber to ensure complete combustion.—W. F. F.

Furnaces and other apparatus; Means for controlling the temperature in —. N. H. Freeman, Chesham, Bucks. Eng. Pat. 120,590, 21.8.17. (Appl. 12,020/17.)

An air vessel in the furnace is connected to a vessel containing mercury so that the expansion of the air drives the mercury up a small tube. This tube swivels on a horizontal trunnion in the mercury vessel, provided with openings so that the tube communicates with the mercury when at any angle to the vertical. The extent of movement of mercury along the tube, and consequently the sensitivity of the instrument, is increased according as the angle of the tube to the horizontal diminishes. An adjustable wire is inserted into the open end of the tube so that at a predetermined temperature in the furnace the mercury makes contact with the wire and completes an electric circuit. The current operates a relay which controls a valve or damper in the gas supply pipe to the furnace.—W. F. F.

Muffle furnaces. T. W. S. Hutchins, Middlewich, Cheshire. Eng. Pat. 120,633, 17.11.17. (Appl. 16,965/17.)

Six muffles are arranged in a circle around a gas producer. Valves are provided so that each muffle chamber may be connected with the adjacent chambers, or with a passage leading from the producer. Valves are also provided controlling air inlets to the muffle chambers and also outlets to the flue. One muffle at a time is opened for discharging and recharging, and the muffle chamber diametrically opposite is placed in communication with the producer. The air supply for this chamber passes through the two muffle chambers on one side, the air valves and communicating valves being opened, so as to preheat the air, and the hot burnt gases are passed through the two chambers on the other side, to the flue, to heat these chambers on the regenerative principle. The connections are then adjusted so that an adjoining muffle may be discharged and recharged, the opposite muffle heated, and the chambers on either side used for preheating the air and receiving the burnt gases respectively.—W. F. F.

Fire-proofing processes and compositions. S. A. Walton, London, Eng. Pat. 120,421, 6.11.17. (Appl. 16,190/17.)

THE double borate precipitated by mixing boiling solutions of zinc and aluminium sulphates with borax is suspended in a colloidal medium, such as gelatin, in the proportion of 1 part of the double borate to 9 parts of a hot gelatin solution containing 4 oz. of gelatin and 12 oz. of ammonium chloride per gallon, at 90° C., and to 8 parts of the finished solution 1 part of borax is preferably added. The resulting fluid is applied in one or more coats as a fireproof glaze, for instance, to the structures of aeroplanes.—J. F. B.

Dehydrating; Apparatus for — M. F. Mangelsdorff, Union Hill, N.J., U.S.A. Eng. Pat. 120,501, 21.2.18. (Appl. 3144/18.)

THE material to be dried is fed into the higher end of a cylinder kept in approximately uniform rotation and set with its axis at a slight inclination to the horizontal. A current of hot air is introduced at the lower end of the cylinder. Longitudinal blades are attached to the inner surface of the cylinder and serve to stir up the mass in its passage through the cylinder. The longitudinal troughs into which the cylinder is divided by the blades are subdivided into pockets by annular discs. Centrally within the cylinder is suspended a longitudinal structure similarly divided up by discs and blades, which rotates with the outer cylinder and serves to break the fall of the material and to promote further agitation. The parts of this inner member are formed of wire cloth or perforated material. Dehydration is slow at first, so that materials such as vegetables do not suffer rupture of the cell walls, and the cell contents are preserved uninjured. The dehydrated material is delivered through a shoot near the lower end of the cylinder on to a travelling belt.

—J. S. G. T.

Centrifugal dryer; Continuous — W. F. Downing, jun., St. Clair, and C. L. Well, Port Huron, Assignors to Diamond Crystal Salt Co., St. Clair, Mich. U.S. Pat. 1,259,727, 19.3.18. Appl., 22.6.17.

A DRUM is mounted on a central, vertical, hollow shaft, which is suspended from a spherical bearing so that the drum can rotate about its true centre of gravity. The material is fed through openings in the hollow shaft into the upper end of the drum; the separated liquid passes through the permeable wall of the drum, and the solids are moved downwards by a worm mounted on a sleeve encircling the shaft. The apparatus is suitable for drying salt and similar materials.

Drying material; Apparatus for — B. R. Andrews, Braintree, Mass. Reissue 14,528, 8.10.18, of U.S. Pat. 1,268,535. Appl., 31.10.18.

A CURRENT of air and the material to be dried pass through a drying tunnel in opposite directions. The dried material is finally delivered into a chamber communicating with the discharge end of the tunnel. By means of sprays and heating devices, the humidity and temperature of the air at various points of the tunnel are independently controlled. By means of a fan the pressure in the discharge chamber is maintained approximately equal to that at the discharge end of the tunnel.

—J. S. G. T.

Tunnel-dryer. G. H. Benjamin, New York. U.S. Pat. 1,280,642, 8.10.18. Appl., 8.1.18.

THE drying kiln is surrounded by a casing, and means are provided for circulating air through

transverse valve-controlled passages extending from the bottom upwards round the kiln, then over the material in the kiln, and downwards to the bottom of the kiln. Heating means are provided in the air passages.—W. F. F.

Emulsifier and clarifier. J. W. Davies, Reading, Mass. U.S. Pat. 1,279,287, 17.9.18. Appl., 23.4.17.

A ROTARY cylindrical chamber is provided with outlet passages in the containing wall, the outlet units extending into the chamber, and taking the liquor from points away from the periphery of the chamber. The outlets are provided with emulsifying nozzles and with deflecting plates to prevent direct flow of the liquid into the nozzles.—C. A. K.

Separating suspended solids from liquids; Apparatus for — F. L. Waterman, Endicott, N.Y. U.S. Pat. 1,279,949, 24.9.18. Appl., 25.7.17.

A RETICULATED metal cylinder is provided with reinforcing bands which support it on grooved rollers so that it can be rotated. The cylinder is provided inside with longitudinal radial wings. The liquid separated from the material fed into the cylinder escapes through the wall of the latter, and the solids are discharged by a conveyor mounted on a carriage which travels on a fixed support extending into the cylinder.

Evaporator. G. H. Benjamin, New York. U.S. Pat. 1,280,641, 8.10.18. Appl., 27.6.17.

A CASING is divided into two superposed chambers by a diaphragm, and each chamber contains a heating unit consisting of horizontal headers connected by vertical tubes. Each heating unit is attached to a removable door at one side of the chamber so that it may be removed bodily, and the heating units are connected in series by external pipes. Each vertical tube is flattened at intervals along its length, the flattened portions being alternately at right angles to one another along the length of the tube.—W. F. F.

Condenser. J. Buhr, Norwood, Ohio. U.S. Pat. 1,280,656, 8.10.18. Appl., 9.1.15.

A CONDENSER coil is contained in a vessel through which a continuous current of cooling medium is maintained. The coil surrounds a central chamber out of communication both with the coil and the outer vessel. Liquid is delivered into the central chamber by a pipe reaching to the bottom, the exit pipe being at the top of the chamber. A number of baffles are contained in the central chamber and serve to retain any sediment and to make better contact between the liquid and the sides of the chamber.—J. S. G. T.

Gravel or other materials; Machine for washing — R. W. Dull, La Grange, Ill., Assignor to The Raymond W. Dull Co., Chicago, Ill. U.S. Pat. 1,280,688, 8.10.18. Appl., 18.9.14.

THE gravel or other material is fed in at one end of a horizontal rotating cylinder containing the washing liquid, and means are provided on the cylinder to lift the material on to fixed shelves from which it overflows on to a lower series of shelves and is thereby moved axially along the cylinder. The lower shelves are carried by a support suspended from the support of the upper shelves in such a way that the lower shelves may be moved axially to vary the rate at which the material is moved through the cylinder.—W. F. F.

Refrigeration apparatus. G. A. Kramer, New York, Assignor to The Frigidor Corporation. U.S. Pat. 1,280,765, 8.10.18. Appl., 12.2.15.

A REFRIGERATING apparatus of the evaporation type comprises a refrigerating coil and a condenser, with a compressor to withdraw vapour from the refrigerating coil and force it into the condenser. The collecting receptacle of the condenser is connected, by a pipe dipping into the liquid, to a chamber containing a float valve, and this chamber is connected to the refrigerator. The condensed liquid is thereby automatically transferred to the float-valve chamber, and heavy impurities are retained in the collecting receptacle of the condenser. The compressor is mounted on a movable support below the refrigerator, and a detachable connection is provided between the compressor and the refrigerating coil.—W. F. F.

Refrigerating machines; Compression —. H. Grasso and J. Rettschnick, s'Hertogenbosch, Holland. Ger. Pat. 308,209, 13.10.15.

IN order to lower the final temperature in the compressor, a portion of the refrigerating liquid is withdrawn from the circuit before expansion and introduced into the compression cylinder, during the compression period, by means of a pump or the like interposed between the regulating valve and the condenser or after-cooler.

Gas-dryer. C. A. Pfanstiehl, Highland Park, Ill., Assignor to Pfanstiehl Co., Inc., North Chicago, Ill. U.S. Pat. 1,281,064, 8.10.18. Appl., 24.7.16.

THE dryer comprises a long slender iron tube set vertically and containing calcium chloride. The gas enters near the lower end. The tube is furnished with observation windows, one at the bottom and one at the top, and a removable drip-pan is provided below the level of the gas inlet.

—J. S. G. T.

Dust collector. F. A. Wegner, Silver Creek, N.Y. U.S. Pat. 1,281,238, 8.10.18. Appl., 22.4.16.

A dust collector comprises a separating chamber with inlet opening and discharge openings for dust and air. An auxiliary dust chamber situated above the separating chamber is enclosed within a tubular guard, and a tube leads from the auxiliary chamber to a point near the lower end of the separating chamber. A portion of the air is returned by means of this tube from the auxiliary chamber to the separating chamber, and is discharged in a downward direction. The end of this tube is furnished with an extensible section.—J. S. G. T.

Extraction of substances; Apparatus for the continuous —. L. Melzer, Kgl. Weinberge, Bohemia. Ger. Pat. 305,919, 10.7.17.

THE extraction vessel proper consists of a cylinder mounted to rotate about a vertical axis and divided into compartments by radial partitions. Above and below the extraction vessel are fixed chambers, the lower one of which serves as a steam boiler. The joints between the cylinder and the fixed chambers are sealed by cylindrical or conical rings, provided with passages so that in certain positions the cylinder communicates with the upper or lower fixed chamber. When the material in one of the compartments is completely extracted, the cylinder is rotated so that this compartment communicates with the lower chamber, and steam is blown through the material. Whilst this compartment is being steamed, others may be filled or emptied, so that the operation of the apparatus is practically continuous.

Leaching process. P. Meyer, Berlin-Johannisthal. Ger. Pat. 308,285, 20.1.17.

THE material to be leached is brought in contact, in countercurrent, at different places in a circuit successively with the solvent and a washing liquid; the latter after use is added to the circulating solvent.—W. R. S.

Cooling tower. G. Politz, Breslau. Ger. Pat. 308,290, 22.1.15.

WITHIN the tower are horizontal series of inclined plates spaced apart and extending over the whole cross-section of the tower. The lower ends of the plates are bent upwards to form collecting gutters which, however, do not extend to the ends of the plates, so that comparatively wide gaps are left free for the ascending current of air. Spaced a short distance above the surface of the plates are baffles to catch any rebounding water and direct it into the collecting gutters. The upper portions of the plates are preferably more steeply inclined than the lower portions.

Cooling apparatus [for air or gases]. E. Jeenicke, Dortmund. Ger. Pat. 308,621, 14.11.17.

AIR or other gas is cooled by means of a rotating drum provided with spirals which form channels between the drum and a surrounding air-tight casing for the passage of the gas. The drum has hollow axles for the introduction of the cooling water, and these may be of the same diameter as the drum, or may be constricted at either end to an extent corresponding to the depth of the water to be kept in the drum for keeping its walls wet.—C. A. M.

Non-conducting material. Eng. Pat. 120,601. See IX.

Dry-kiln. U.S. Pat. 1,281,212. See IX.

Desiccating apparatus. U.S. Pat. 1,259,890. See XIXa.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Methane and air; Inflammation of mixtures of — in a closed vessel. R. V. Wheeler. Chem. Soc. Trans., 1918, 113, 840—859.

THE phenomena associated with the inflammation of mixtures of methane and air have been examined. The mixtures were contained in closed spherical vessels fitted so as to permit of ignition at the centre. Comparative observations were made in vessels of about four and sixteen litres capacity respectively, the principal data obtained being the various pressures developed, the rates of development of pressure, and the speeds of propagation of flame. For mixtures containing from 7.5 to 12.5% of methane the maximum pressures recorded were the same in the two vessels, and in such mixtures the propagation of the flame appears to follow regular concentric spherical surfaces in such manner that the flame reaches the walls of the vessel simultaneously at all points. In consequence, the inflammation of the mixture is complete before cooling by conduction of the walls comes into play. On the other hand, with mixtures which contain less than 7.5 or more than 12.5% of methane, the more slowly moving flame reaches the bottom of the vessel later than it reaches the top, the difference in time varying with the composition of the mixture. For such mixtures, cooling by conduc-

tion begins before complete inflammation and before the maximum pressure is attained. The curves obtained by plotting the recorded pressure against time appear to indicate three distinct stages in the inflammation process. The first stage, in which the pressure increases with the time in a linear manner, corresponds with the propagation of flame within the sphere. The third stage, in which the pressure falls, represents the cooling of the products of combustion, and the second stage, in which the pressure remains constant for some little time, probably represents a balance between the cooling effect of the walls and the effect of the equalisation of temperature differences within the gaseous mass. When a rapidly revolving fan is introduced into the explosion vessel, the horizontal portion of the pressure curve is no longer obtained and the maximum pressure recorded is higher than in a corresponding experiment made without the mechanical mixer. There is a close correspondence between the time taken for the flame to reach the top of the explosion vessel and the time recorded for the development of the maximum pressure, although the first appearance of the pressure effect is considerably later than the time of ignition.—H. M. D.

Tar as fuel oil for Diesel engines. O. Schertel. *J. Gasbeleucht.*, 1918, 61, 493—495.

HEATED filtered tar has been used with complete success for three years as fuel for two 100-H.P. Diesel engines worked alternately. Paraffin oil, when available, was used as ignition oil, but on occasion tar was used alone. When paraffin oil became no longer available, gas oil and heavy petroleum were used as ignition oils. It was then found to be advantageous to run on tar-oil for 5 to 10 minutes at starting, a procedure unnecessary with paraffin oil. The tar had a calorific value of about 8700 cal., and 337 grms. of tar with 20 grms. of ignition oil were required to produce 1 H.P.-hour. The cost of running with the usual oil of calorific value about 10,000 cal. would have been 2½ times as great. The cylinders and piston rings remained bright and clean throughout. The crude tar was run into large storage tanks where it was kept heated by hot-water pipes, and where water and solid matter separated. It was then pumped up to a high-level tank holding sufficient for one day's working (about 500 kilos.). Here also the tar was kept heated and a further separation of water took place. Thence the tar ran by gravity through two gravel filters, the grain-size in the first filter being 3 to 5 mm., and in the second 1 to 2 mm., and from these through a meter and a regulator to a heater where the temperature was raised to about 60° C. Preheating of the tar to this temperature was found to be necessary to ensure complete combustion. Two pairs of filters were used alternately in periods of about 3 weeks, during which time about 10,000 kilos. of tar passed through. A steady flow of tar through the filters was obtained by fitting to the outlet from the fine filter an open vertical pipe in which the filtered tar ascended when the feed to the engine was interrupted by the regulator. The heating of the tar and of the water for the pipes in the tanks was accomplished by the exhaust gases from the engine.—T. St.

Petroleum oils and their products; "Degree of mercuration" of crude — for the control of the refinery processes. J. Tansz. *Petroleum*, 1918, 13, 649—654. *Z. angew. Chem.*, 1918, 31, Ref., 336.

THE crude oil or distillate is shaken with a methylalcoholic solution of mercuric acetate, the liberated acetic acid being then estimated by titration; the number of c.c. of N/1 potassium hydroxide neces-

sary to neutralise the acetic acid liberated by 100 c.c. of oil is designated "the degree of mercuration," and provides a measure of the undesirable constituents, such as unsaturated hydrocarbons, sulphur compounds, asphaltic and resinous compounds, and phenols which react with mercuric acetate with formation of mercury compounds and liberation of acetic acid (see this J., 1918, 554A). —D. F. T.

Lubricating oils; Testing —. R. Dubrisay. *Ann. Falsif.*, 1918, 11, 309—310.

REPLYING to Nicolardot and Masson (this J., 1918, 499A) the author states that his instrument (this J., 1917, 1123) is not intended for determining the viscosity of oils; it may, however, be used for rapidly determining differences of fluidity of oils. —W. P. S.

Combustion in furnaces. Escher. See X.

Trade effluents. Wilson. See XIX.

PATENTS.

Coke; Apparatus for the manufacture of —. F. J. Sivy, Edmonton, Queensland. Eng. Pat. 113,091, 9.1.18. (Appl. 531/18.) Int. Conv., 2.2.17.

AN open-ended arched oven is provided with rails extending through it on which a wheeled truck carrying the charge of coal is conveyed into the oven. The sides and bottom of the truck are made double-walled, with suitable openings to allow air to circulate, and the truck is of the same length as the oven, so that its end wall forms part of the closure of the oven, the remaining spaces above and below being closed by doors and sealed. When the coking is finished, the truck is run out of the oven and discharged. One of the side walls of the truck is hinged to facilitate discharge. Air for combustion is admitted through adjustable openings in the upper end doors, and the gaseous products are withdrawn from the top of the oven.—W. F. F.

Retorts for the continuous carbonisation of coal and the like; Vertical —. S. Glover, St. Helens, J. West, Southport, and W. Wild, Blackpool. Eng. Pat. 120,458. (Appls. 17,103, 20.11.17, and 7586, 6.5.18.)

STEAM under pressure is passed through a tubular superheater at the base of the waste gas chimney of the vertical retort bed, and then through pipes in the waste gas circulating flues at the top of the setting. The steam then passes down through vertical passages in a partition in the vertical flue through which the hot gases from the combustion chambers of the retort bed pass upwards. The highly superheated steam then passes into the retorts to generate water-gas. In horizontal or inclined retorts such as those described in Eng. Pat. 113,981 (this J., 1918, 233A) the steam is admitted into the retort beneath the hot coke which is being discharged, and the retort is maintained full of incandescent fuel, so that the steam must pass through it to the gas outlet at the charging end. —W. F. F.

Gas-making retort. Ehrhardt und Sehmer G.m.b.H. in liquidation, Saarbrücken. Ger. Pat. 308,252, 31.10.16.

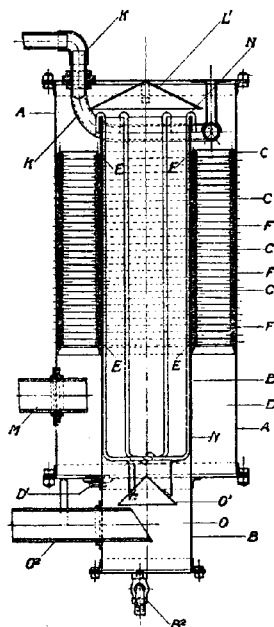
A RETORT of increasing cross-section from the top downwards, which serves also as a feed tube for a gas producer and is heated by the hot gas from the latter, is provided with a conical hollow core so that the thickness of the column of fuel is approximately the same throughout the retort. The hollow core may be used as gas-outlet pipe.

Gas producers. D. J. Smith, London. Eng. Pat. 120,599, 18.10.17. (Appl. 15,089/17.)

A VERTICAL cylindrical producer chamber is provided with a superposed boiler, and air is drawn over the water in the boiler by the suction of a gas engine. The air and water vapour pass into the ash-pan of the producer and then upwards through the fire, which is kept shallow to avoid slow distillation. The producer gas passes from the combustion chamber through a gas cooler in which the cooling water is the boiler feed water, and then through a scrubber such as that described in Eng. Pat. 120,684 (following) to the engine. The boiler is provided with an overflow from which the surplus water passes to an annular trough in the ash-pan. A transverse shaft in the ash-pan is continuously rotated by the engine and carries a series of cams which are adapted to oscillate one end of the firebars progressively from one side of the grate to the other, thus agitating the fire. The other ends of the firebars are pivoted on a fixed spindle. The same shaft also operates the boiler feed pump through a crank of adjustable length. The fuel is fed into the producer from a hopper above by a worm conveyor, and the ash is discharged from the ash-pan by a rotary valve, all these devices being driven from the same shaft through adjustable cranks, and consequently at proportional speeds. The air inlet to the boiler is provided with a throttle-valve which is connected to the throttle-valve of the engine, so that the pressure in the boiler is reduced and more steam is generated and supplied to the fire when there is an increased demand for gas.—W. F. F.

Scrubbers, cleansers and coolers for [producer] gas. D. J. Smith, London. Eng. Pat. 120,684, 18.10.17. (Appl. 2832/18.)

THE annular space between two concentric cylinders, A, B, is provided with superposed annular discs, C, separated by rubber rings, E, F. Each

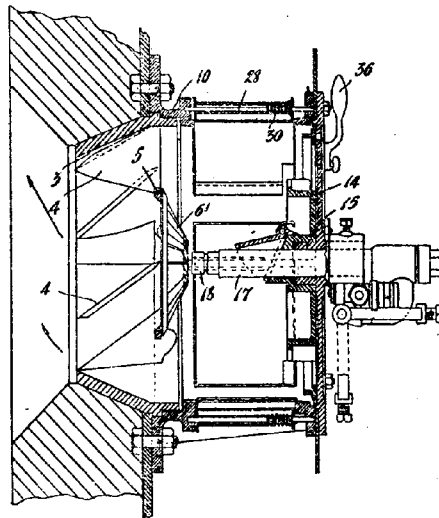


disc has one rectangular opening in it, and the discs are arranged so that these openings are alternately at opposite ends of a diameter. The washing water

is sprayed on to the discs by a circular perforated pipe, K, and trickles downwards over the annular discs in a zigzag path. The gas to be treated enters by the pipe, M, traverses the water film in counter-current, passes under the hood, L', and then downwards through a wire basket, N, filled with pieces of coke. The gas is then deflected outwards by the cone, O', to separate the solid particles, and is finally discharged through the pipe, O'. Sludge and tar are removed from the chamber, D, through the outlet, D', and from the chamber, O, through the outlet, B'.—W. F. F.

Oil burning apparatus. Babcock and Wilcox, Ltd., London. From The Babcock and Wilcox Co., New York. Eng. Pat. 120,489, 23.1.18. (Appl. 1323/18.)

THE front of the furnace is provided with a conical mixing chamber, 3, having substantially triangular blades, 4, normal to the conical surface, and at an angle of about 60° to the front plate of the furnace. A central ring, 5, carries a number of inclined blades, 6', as described in Eng. Pat. 27,672 of 1911 (this J., 1912, 1021) to give the air a whirling motion, or a flat deflecting plate as described in



Eng. Pat. 18,712 of 1911 (this J., 1912, 864) may be used. A cylinder, 10, is attached to the furnace front and its closing plate, 14, is provided with a hub, 15, to carry the burner, 17. The outlet, 18, of the burner is close to the air-deflecting blades, 6'. The cylinder, 10, is provided with large air openings on its cylindrical face, which are controlled by similarly shaped curved plates or doors pivoted on the pins, 28, and normally kept in their open positions by the springs, 30. The doors may be partly or wholly closed by a cam mechanism operated by the hand lever, 36.—W. F. F.

Viscous mineral oils or mineral oil distillation residues; Conversion of — into less viscous hydrocarbons of approximately the same specific gravity. Allgem. Ges. für Chem. Ind., Berlin. Ger. Pat. 308,197, 30.6.15.

THE viscous oil is heated for a short time at 360°–420° C. under 4–6 atmospheres pressure; by this treatment it is possible to effect an alteration in the molecular condition of the material whilst restraining any further thermal decomposition.—D. F. T.

Coal-gas; Extraction and recovery of vaporous and gaseous constituents from —. R. Lessing, London. U.S. Pat. 1,281,597, 15.10.18. Appl., 8.10.15.

SEE Eng. Pat. 10,022 of 1915; this J., 1916, 883.

Hydrocarbon oils; Apparatus for vaporising —. C. B. Forward, Urbana, Ohio, U.S.A. Eng. Pat. 120,026, 15.11.17. (Appl. 16,822/17.)

SEE U.S. Pat. 1,255,149 of 1918; this J., 1918, 200 A.

Petroleum oils; Process and apparatus for converting —. M. J. Trumble, Los Angeles, Cal., Assignor to Shell Co. of California, San Francisco, Cal. U.S. Pat. 1,281,884, 15.10.18. Appl., 19.7.15.

SEE Eng. Pat. 15,084 of 1915; this J., 1916, 1210.

Ammoniacal liquor. Eng. Pat. 120,596. See VII.

Asphalt-like composition. U.S. Pat. 1,279,918. See IX.

Combustible gases. Eng. Pat. 120,661. See XXIII.

Viscosimeter. U.S. Pat. 1,281,042. See XXIII.

Gas analysis. Ger. Pat. 308,005. See XXIII.

IIB.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Tungsten filaments; Treatment of —. C. T. Fuller, Nutley, N.J., Assignor to General Electric Co. U.S. Pat. 1,280,704, 8.10.18. Appl., 13.4.14.

TUNGSTEN wire which has been drawn by the usual methods, and which is to be later subjected to a temperature substantially higher than that of red heat, is heated to at least a red heat in an oxidising atmosphere in order to improve its mechanical properties.—T. H. B.

Incinerating kelp. U.S. Pat. 1,282,708. See VII.

III.—TAR AND TAR PRODUCTS.

Tar in Diesel engines. Schertel. See IIA.

PATENTS.

Distillation of benzol homologues; Classifying apparatus for use in the —. F. Tschuby, Fairfield, Ala. U.S. Pat. 1,282,324, 22.10.18. Appl., 5.7.17.

THE apparatus consists of a dephlegmator, a rectifying column through which the condensed liquor from the dephlegmator passes, and a tubular heater through which the condensed liquor from the rectifying column passes. The tubes of the heater project a short distance beyond the bottom of the rectifying column to cause the liquid to flow through in thin films, the arrangement being such that only the homologue desired passes down through the heater, lower boiling homologues being vaporised and passing upwards through the rectifying column to mix with the products passed by the dephlegmator,

maintaining the required vapour pressure therein. The liquid passing through the heater passes into an insulated header and thence into a cooler.

—L. A. C.

[Naphthalene] sulphonic acids; Separation and purification of —. J. E. Southcombe and R. M. Downie, Birkenhead. Eng. Pat. 120,405, 7.9.17. (Appl. 12,839/17.)

INSTEAD of neutralising the product obtained by the sulphonation of naphthalene completely with lime, it is partially neutralised with sodium carbonate or sodium hydroxide, and lime is then added to the boiling solution until a filtered test portion gives a heavy precipitate of calcium carbonate on addition of sodium carbonate. Calcium sulphate is then removed by filtration, and the lime in the filtrate removed by precipitation with sodium carbonate and subsequent filtration. The filtrate contains the sodium naphthalenesulphonates. If desired, the sodium carbonate (or hydroxide) and lime may be added in quantities corresponding to the sulphonic acids and the free sulphuric acid respectively.

—L. A. C.

Rubber composition. U.S. Pat. 1,282,505. See XIV.

IV.—COLOURING MATTERS AND DYES.

Methyl Violet as sensitiser. Yoshida. See XXI.

PATENTS.

Dyes [from peat]; Production of —. A. M. Hart, Croydon, Surrey. Eng. Pat. 120,588, 13.3.17. (Appl. 11,625/17.)

DRIED and powdered peat is treated with sulphuric and nitric acids, either in succession, or together, and the solution filtered. The "acid filtrate" so obtained, diluted with water, may be used alone as a dye-bath, or may be "diazotised" with sodium nitrite, and used in conjunction with a grounding bath of, e.g., β -naphthol, or a metallic mordant, e.g., potassium ferrocyanide, and, if desired, a developing bath of, e.g., naphthylamine. Alternatively the "acid filtrate" may be neutralised with sodium carbonate, or the like, and allowed to crystallise, a solution of the crystals being used as before. The bath may be used also for treating cotton previous to dyeing with colours which are not readily applied to that fibre, e.g., cochineal.

—L. A. C.

Disazo colouring matters and process of making the same. A. E. Gessler, Staten Island, N.Y. U.S. Pat. 1,281,938, 15.10.18. Appl., 20.12.17.

A DISAZO dyestuff is prepared by coupling the tetrazo derivative of di-*p*-aminoditolyl with 2,6-naphtholmonosulphonic acid, and converting the product into its copper salt. The colouring matter so formed is insoluble in water, oil, and benzene, cannot be sublimed, and gives a greenish-blue colour with concentrated sulphuric acid.

—L. A. C.

Ortho[hydr]oxyazo dyestuffs; Substantive — and process of making same. E. Anderwert, H. Fritzsche, and H. Schobel, Assignors to Society of Chem. Ind. in Basle, Switzerland. U.S. Pats. 1,282,354, 1,282,355, and 1,282,356, 22.10.18. Appl., 6.10 and 7.10.15 and 26.4.17.

SEE Eng. Pat. 12,250 of 1915; this J., 1916, 1068.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cotton; Constituents of raw —. E. Knecht and W. Hall. J. Soc. Dyers and Col., 1918, 34, 220–224.

THE systematic series of consecutive extractions described previously (this J., 1911, 813, 1007) was repeated under comparative conditions with 2-ply 60's American and Egyptian yarns. The results previously recorded were confirmed, except for unimportant quantitative differences. Both the alcoholic and aqueous extracts were extremely rich in mineral matter, a considerable proportion of which consisted of potassium salts. On dialysis of the aqueous extract, it was separated into a diffusible portion extremely hygroscopic and very rich in potassium salts, and a residue which on evaporation yielded a non-hygroscopic brittle resinous substance. Nitrogen determinations were carried out on the yarns after each treatment; the benzene, alcohol, and water extracted only 14.1–16.7% of the total nitrogenous matter. Experiments on the removal of nitrogenous matter from raw cotton in a single treatment showed that boiling at atmospheric pressure for 6 hours with 2% caustic soda solution removed 78–80% of the total nitrogen; boiling with lime for 12 hours removed 37.5%, but this was increased by subsequent souring to 53.1%; hot soaping removed only 17.5%. Further experiments, in imitation of the industrial process, boiling under 35 lb. pressure per sq. in., showed with a yarn containing originally 0.248% of nitrogen, the following results, representing the proportion of nitrogen remaining in the yarn after each stage (original=100):—After lime boil, 54%; after sour, 40.5%; after caustic boil, 27.1%; after sour, 25.8%; after bleach liquor, 6.7%; after sour, 5.8%. A preliminary examination has been made of the various extracts. The lime extract gave a gelatinous precipitate with alcohol, free from nitrogen and corresponding with pectic acid. The portion soluble in alcohol gave two brown resinous substances of different solubilities, containing 9.1 and 9.6% of nitrogen respectively; these are described as colouring matters. There was also a small quantity of fatty acid. The total substance extracted from the cotton by the lime boil was 21%, which included the greater portion of the mineral constituents of the cotton. The first hydrochloric acid extract (lime sour) contained mainly a fatty acid corresponding apparently with stearic acid, together with a dark-coloured wax, m.p. 77°–80° C.; there was also a small quantity of brown resinous substance similar to that present in the lime extract. The caustic soda extract yielded a brown residue fairly rich in nitrogen and phosphoric acid. The solid residue yielded a further quantity of the brown colouring matter soluble in alcohol; the matter insoluble in alcohol gave the general reactions of protein. On acidification of the soda extract a dark-coloured protein, containing 18.75% of nitrogen, was isolated. From this extract were obtained also a black, brittle, shining mass, soluble in ammonia and containing 9.6% of nitrogen, and a mixture of pectic acid and colouring matter. The total substance extracted from the cotton by the above three main treatments was about 4%. The hygroscopic moisture of the raw cotton was 7.36% and that of the scoured and bleached cotton 6.14%.—J. F. B.

Cotton cellulose: structure and constitution.
C. F. Cross and E. J. Bevan. J. Soc. Dyers and Col., 1918, 34, 215–218.

A SPECIMEN of powdered cotton produced by the stamping action of the finishing "beetles" when working for a prolonged time on the same area of cloth has been submitted to chemical and physical examination. The dimensions of the cellulose par-

ticles were similar to those of starch granules but without the organised structure. The particles were inert towards polarised light, in sharp contrast to the original cotton fibres. The elementary composition calculated on the dry ash-free substance corresponded accurately with the formula, $C_6H_{10}O_5$, and the hygroscopic moisture under ordinary atmospheric conditions was normal, namely 5–6%. On treatment with caustic soda lye of 17.5% strength, the cotton powder gave indications of a profound modification, showing 40–56% of the soluble forms of cellulose (β - and γ -celluloses), a large and variable proportion of which was re-precipitated on acidification. The product recovered after treatment with the alkali showed considerable resistance to acetylation with the aid of sulphuric acid as catalyst. The cotton powder is characterised by a particularly low specific volume (0.635), or high density, as compared with normal cotton. The specific volume changes with rise of temperature, showing a minimum value at 35° C. and a maximum at 77° C. Above this temperature a sharp loss of volume occurs, accompanied by a visible hydration effect; the suspended cellulose, previously in the form of a fine powder, changes to a flocculent curd, but the phenomenon is reversible and the cellulose resumes its original appearance on cooling. The authors discuss the analogies between this modified cellulose and starch which, after drying at 100° C., also shows a rapid loss of volume in water at the gelatinisation point.—J. F. B.

Wool; Some effects of moist and dry heat on —.
A. Woodmansey. J. Soc. Dyers and Col., 1918, 34, 227–230.

IN the conditioning of wool the removal of hygroscopic moisture is considered complete after heating the wool at 100° C. for 40 minutes, provided the ventilation is sufficient. At 150° C. a gradual small loss of matter other than water takes place. The tensile strength increases on drying and decreases on damping, and the tensile elongation varies in the inverse sense. On boiling with water a partial solution of wool substance occurs, with liberation of small quantities of ammonia and hydrogen sulphide. Wool damped with cold water recovers most of its original strength on re-drying, but wool boiled with water for one hour suffers a permanent loss of strength. Heating with water at 130° C. completely disintegrates the wool. On the other hand, wool in the dry state suffers only a moderate loss of strength on heating at very much higher temperatures, e.g. 150°–200° C. The effect of dry heating on wool is a function of the time of heating. When the temperature is raised gradually the first signs of darkening appear at about 145° C. When heated for 3 hours at 150° C., the scorched wool still shows the scale markings but the surface is covered with longitudinal striations. Wool heated at 175° C. for 3½ hours does not re-absorb the normal amount of moisture; its absorption capacity for sulphuric acid is also diminished. On heating in a current of air, ammonia is evolved, a larger quantity in the moist condition than in the dry. Heated wool becomes acid, partly on account of the oxidation of the sulphur to sulphuric acid and partly on account of the loss of ammonia. The decomposition of wool under the influence of heat may take place with the formation of an amide which in presence of moisture undergoes hydrolysis, forming an acid and ammonia. The dyeing properties of scorched wool are analogous to those of faded wool, as is also its increased solubility in alkalis and in water. From a neutral bath of an acid dyestuff, scorched wool takes a deeper shade than unheated wool, presumably on account of its acid character; with an acid bath there is little

difference between heated and unheated wool, though the unheated wool gives brighter shades. With basic dyes there is little difference in depth, but the heated wool is duller and redder. In none of the changes which wool undergoes on heating is there any sharp critical temperature; the changes take place gradually and a long time at a lower temperature is equivalent to a shorter time at a higher temperature.—J. F. B.

Trade effluents. Wilson. See XIXa.

PATENTS.

Paper pulp [from papyrus]; Production of —.
H. H. Spicer, London. From J. Wells, Cairo, Egypt. Eng. Pat. 120,086, 24.10.17. (Appl. 15,467/17.)

PAPYRUS is thoroughly dried and matured, for instance, by storage for one year, and then crushed between rollers; the crushed material is boiled for 4–8 hours in open pans with water and 25–30% of its weight of lime, and treated mechanically for the separation of the fibres. Sudan papyrus yields about 36% of fibre. Alternatively, the inner fibre and pith alone may be treated by this process.

—J. F. B.

Paper-making machines [suction couch rolls].
J. M. Blyth, Leith. Eng. Pat. 120,147, 5.1.18. (Appl. 298/18.)

A suction couch roll is composed of a central solid roller and an outer perforated cylinder, which is supported concentric with the solid roller by means of intermediate rollers, which revolve in bearings on the end frames. The central roller and outer cylinder are positively driven in opposite directions, and the intermediate rollers revolve by frictional contact with the driven parts of the apparatus. In the area of the cylinder which is covered by the web of paper, three of the intermediate rollers are covered with rubber to make air-tight contact with the central roller and the perforated cylinder, so that this portion of the space between the central roller and the outer cylinder is divided into two vacuum chambers. The ends of these chambers are closed by end-pieces with air-tight packing joints which are continuously flooded with water, and means are provided for shifting the end-pieces towards or away from each other to accommodate varying widths of paper.—J. F. B.

[Paper] machine [suction-boxes]; Fourdrinier —.
W. A. Murray and C. E. Puham, Chisholm, Me. U.S. Pat. 1,280,524, 1.10.18. Appl., 14.5.18.

In a Fourdrinier machine, several suction-boxes are coupled together and the whole set is connected with a mechanism for imparting to it a unitary reciprocating movement in the direction of the travel of the wire.—J. F. B.

Porous vessels [of paper or cardboard]; Rendering — impervious to the fluid they are intended to contain. G. H. Hadfield, Mitcham, and A. E. Bawtree, Sutton, Surrey. Eng. Pat. 120,410, 4.10.17. (Appl. 14,883/17.)

In making the joint between the sides and ends of the vessel, one or both of the surfaces to be united are previously coated with a composition similar to that which is to be used for making the porous portions impervious, and the parts are joined before the composition has dried. The vessel, consisting, for instance, of a paper or cardboard tube with metal caps or rings at the ends, is then mounted on a revolving support, and a little

of the melted composition is poured in. The vessel is rotated on a horizontal axis at a sufficiently high speed to cause the centrifugal force to overcome the effect of gravity on the portions of the fluid which for the time being are vertically above the axis of rotation. In order to obtain a uniform coating, it is essential that any error in the centring of the vessel should be less than the thickness of the film. The distribution of the fluid may be assisted by the application of a brush to the interior of the rotating vessel.—J. F. B.

Porous material [e.g., fibre-board]; Method of filling and indurating — and the product thereof.
W. V. Lander, Newton, Mass., Assignor to General Indurating Corporation. U.S. Pat. 1,278,943, 17.9.18. Appl., 8.11.15.

THE pores of the material, e.g. fibre-board, are filled with a mixture of resin and petroleum residue (in which the quantity of resin is at least equal to that of the petroleum residue), dissolved in a volatile carrier, such as petroleum spirit. After impregnation the surface of the impregnated material is bathed in the vapour of the solvent and the material is then indurated by evaporation.

—J. F. B.

Fibre-board; Water- and fire-resisting — and process of manufacture. A. L. Clapp, Marblehead, Assignor to The Metalite Co., Amesbury, Mass. U.S. Pat. 1,280,400, 1.10.18. Appl., 27.4.16. Renewed 3.12.17.

VEGETABLE material is treated with a solution of caustic alkali so as partly to dissolve the material. The dissolved matter and the residue are mixed with fibrous cellulose in water and beaten to a finely divided state. The dissolved matter in the stock is then precipitated by a metallic salt and the resulting pulp is formed into sheets.—J. F. B.

Brake-lining and method for preparing the same.
W. D. Pardoe, Assignor to Thermoid Rubber Co., Trenton, N.J. U.S. Pat. 1,277,108, 27.8.18. Appl., 16.3.17.

A FABRIC is passed through a solution containing asphalt, preferably gilsonite, mixed with lead oxide, sulphur, and an oxidation accelerator, e.g. hexamethylenetetramine, and is then subjected to a pressure of 150 lb. per sq. in. and a temperature of 300°–400° F. (150°–205° C.) to vulcanise the impregnating material. The product is practically unflammable, has an unusually high coefficient of friction and good wearing qualities, and does not become sticky under working conditions.

Plastic composition [ethylcellulose] and method of making the same. P. C. Seel, Assignor to Eastman Kodak Co., Rochester, N.Y. U.S. Pat. 1,281,080, 8.10.18. Appl., 7.2.18.

A CELLULOSE ether, such as ethyl cellulose, is mixed with a chlorine substitution product of a carbocyclic compound, such as naphthalene, in chloroform and alcohol.—J. F. B.

Cellulose-containing materials; Process for treating — and recovering substances used therein.
O. G. Stage, Three Rivers, Quebec. U.S. Pat. 1,279,604, 24.9.18. Appl., 14.3.18.

PART of the "black liquor" is withdrawn from the digester after its digestive action is completed and is replaced by weak liquor. The pulp in the digester is washed with this weak liquor, and the liquor is preserved at the temperature and pressure of the digestion.—J. F. B.

Celluloid-like substance and process of making the same. S. Satow, Sendai, Japan. U.S. Pat. 1,280,862, 8.10.18. Appl., 30.12.16.

VEGETABLE proteins are hydrolysed, and the hydrolysed product is glutinised to form a plastic and elastic mass. A substance resembling celluloid is made with hydrolysed proteins, a viscous material, a fibrous material, and a reducing agent.—J. F. B.

Waterproofing fibrous material; Process for —. P. F. Bovard, Winona, Minn. U.S. Pat. 1,280,954, 8.10.18. Appl., 4.6.17.

THE material is immersed in a solution of saponified linseed oil and casein until the fibres are thoroughly saturated; the excess moisture is then removed by squeezing, and the material is immersed in a solution of an aluminium compound, and finally dried.—J. F. B.

Cellulose; Apparatus for the manufacture of —. E. Schaufelberger, London. U.S. Pat. 1,282,635, 22.10.18. Appl., 25.5.17.

See Eng. Pat. 113,494 of 1917; this J., 1918, 203 A.

Fireproofing. Eng. Pat. 120,421. See I.

Asphalt-like composition. U.S. Pat. 1,279,918. See IX.

Insulating material. U.S. Pat. 1,281,097. See IX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

"Dry dyeing" process; Use of acid colours in the —. M. Fort. J. Soc. Dyers and Col., 1918, 34, 226—227.

THE remarkable penetrating powers of carbollic acid and allied phenols when applied to animal fibres and their solvent properties towards many acid dyestuffs have led to the development of a process of "dry" dyeing of woollen and other fabrics. Commercial cresol, b.pt. 190°—200° C., has been found to be the cheapest and most satisfactory solvent. The presence of a small quantity of water, e.g. 5% on the weight of the cresol, is necessary. The cresol or other phenol cannot be employed directly on account of its shrinking action on wool. Shrinkage is accompanied by an increase in the tensile strength and elongation of the yarn, but there is a pronounced development of scales and increased felting properties. The shrinking action of the cresol may be prevented by diluting the cresol solution of the dyestuff with a neutral solvent such as petroleum spirit, naphtha, or nitrobenzene. Solvent naphtha boiling above 100° C. is the diluent most generally useful and permits the use of heated dyebaths. The addition of formic acid increases the solvent power of the cresol for acid dyestuffs. A typical dyebath for blue shades is made by dissolving 0.1 part of Patent Blue Superior in 0.5 part of water, 0.5 of formic acid, and 10 parts of cresol. These are mixed in the order named, and the solution is diluted with solvent naphtha to 100 parts. Dyeing is performed at 50°—80° C. for from 5 to 30 minutes. Yellow shades are dyed with Naphthol Yellow S, red with Crystal Ponceau or Crystal Scarlet, black with Neral B. The dyed goods are squeezed or centrifuged, rinsed thoroughly in petroleum spirit or naphtha to which 5% of cresol is added, and passed through the ordinary dry-cleaning process to complete the removal of the cresol.—J. F. B.

Effects of heat on wool. Woodmansey. See V.

Trade effluents. Willson. See XIX B.

PATENTS.

Dyeing machines. H. M. Dudley, Philadelphia, Pa. U.S. Pats. (A) 1,280,185, (B) 1,280,186, (C) 1,280,187, (D) 1,280,188, (E) 1,280,189, and (F) 1,280,190, 1.10.18. Appl., (A) 13.3.17, (B) 1.6.17, (C) 19.9.17, (D) 24.9.17, (E) 24.9.17, (F) 29.10.17.

(A) THE dyeing receptacle contains a series of adjustable, parallel, foraminous plates spaced from each other and having oppositely disposed pyramidal members. At each end of the receptacle is a chamber, abutting thereon and capable of being moved outwards free from the dyeing receptacle. Each of these chambers contains a series of divergent elements and is connected with a pump capable of circulating liquid through the chambers and through the foraminous plates and the dyeing receptacle. Means are provided for revolving the receptacle and for removing it from between the end chambers. (B) The receptacle is divided into a series of superposed fibre chambers with unperforated sides, each chamber having a fixed foraminous bottom with members extending upwards and a movable foraminous top with members extending downwards, and the fibre is compressed within the chambers by the downward movement of the tops. A central unperforated member extends through the receptacle and the fibre chambers surround it; a liquid chamber is situated beneath the series of fibre chambers and there is a second liquid chamber containing unperforated members diverging upwards beneath the first one. (C) In the receptacle is situated a reel with a foraminous cylindrical body having members extending outwards and unperforated flanges, which can be revolved within the receptacle. The reel is adapted to receive a number of strips of fabric wound thereon, successive rolls of fabric being separated by a series of extensible members sliding over the outer face of the cylinder and closing holes which are not covered by the rolls of fabric, so that the whole of the liquid forced through the machine impinges on the inner face of the fabric rolls. An adjustable foraminous cover having members extending inwards is wrapped around the fabric rolls, and the cylinder is connected at both ends with sources of liquid supply. (D) In a machine similar to that last described, a series of removable conduits is arranged around the exterior of the fabric roll and connected to a common liquid supply, and another set of conduits is arranged inside the cylinder and connected with another liquid supply. The sets of conduits are revolved with the cylinder, and liquid is passed through them and through the fabric in either direction. (E) A machine of the type described under (D), is provided with liquid-distributing arrangements diverging inwards, below the bottom plates, and similar distributing means above the top plates; oppositely extended convergent members are situated centrally of the series of fibre chambers, extending above the top plates and below the bottom plates so as to produce a divergence of the liquid column. A removable cover is fitted to the receptacle, and both the top and the bottom of the apparatus are connected with a pump circulating liquid in either direction. (F) Each of the series of fibre chambers in the receptacle has two fixed foraminous bottom plates spaced apart and two movable top plates spaced apart; the receptacle is provided with a bottom portion containing baffle-plates and a top portion containing baffle-plates, each of these portions being connected with a source of supply of liquid which can be circulated in either

direction. In all the different types of machine described, small exterior testing devices similar to the respective types of large machines are attached to each fibre chamber or dyeing receptacle, and the liquid is circulated through the larger and smaller devices simultaneously, the small device being capable of being shut off for examination without interrupting the flow of liquid through the larger device.—J. F. B.

Dyeing apparatus. A. Rudler, Oxford Furnace, N.J. U.S. Pat. 1,282,633, 22.10.18. Appl., 13.4.18.

The yarn or the like to be dyed is supported on needles mounted in holders which slide in adjustable slotted racks carried by a frame. The frame is mounted to revolve about another frame, which can be moved vertically into and out of the dye-vat.

Di- and triarylmethane dyestuffs; Preparation of fast vats from —. H. Wieland, Munich. Ger. Pat. 308,298, 1.9.16.

Di- and triarylmethane dyestuffs are reduced with hydrosulphite in alkaline solution, giving reduction products which have all the properties of vat dyestuffs and are oxidised rapidly on the fibre by the action of the air. The leuco-derivatives form a class of compounds which have the SO_2Na group attached to the methane carbon atom, possibly with SC linking or perhaps in the form of OSONa . It is suggested that the two SO_2Na residues of the hydrosulphite become attached to the quinonoid system of the dyestuff and that one of the two groups is then split off as sulphite.—J. F. B.

Cotton fabrics or yarns; Printing of [coloured discharge effects on] —. The Calico Printers' Association, Ltd., Manchester, F. Ashton, and G. Nelson, Hyde. Eng. Pat. 120,152, 19.1.18. (Appl. 1137/18.)

A sulphur or vat dyestuff with a suitable reducing agent is printed on or under a metallic mordant together with sodium citrate, tartrate, or lactate adapted to discharge the mordant in the printed areas when the goods are subsequently steamed and finally dyed with a mordant dyestuff. The vat or sulphur dyestuff, together with the citrate discharge, may be printed on goods previously prepared with β -naphthol and a metallic mordant, and a diazo salt may be incorporated with the printing mixture or printed separately; or alternatively, the cloth may be prepared with a metallic mordant, then with Aniline Black mixture, and finally printed as before, steamed, and dyed with a mordant dyestuff.—J. F. B.

Gums for the production of thickenings suitable for calico and other textile printing and finishing; Treatment of insoluble, natural —. The Calico Printers' Association, Ltd., Manchester, J. B. Fothergill, and G. W. Wilson, Dinting Vale, Derby. Eng. Pat. 120,183, 22.6.18. (Appl. 10,299/18.)

KARAYA gum and other insoluble gums of the East Indian and Persian type are converted into a soluble form by treating with a solution of sodium or potassium peroxide, percarbonate, persulphate, or persulfate, and the solution is subsequently neutralised and bleached if necessary. Example: 160 lb. of powdered karaya gum is stirred into 40 galls. of water containing 8 oz. of sodium peroxide; after $1\frac{1}{2}$ hour, a solution of 9 oz. of sodium peroxide in 5 galls. of water is added, and the liquid is heated and boiled for $3\frac{1}{2}$ hours, cooled, neutralised with hydrochloric acid, diluted to 80 galls., and clarified. When used for textile finishing the solution of gum may be bleached with hypochlorites.—J. F. B.

Dyes [from peat]. Eng. Pat. 120,588. See IV.

Composition for building. U.S. Pat. 1,279,119. See IX.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitrogen; Fixation of atmospheric — as cyanide. Y. Morimoto. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 881–898.

From the results of a study of Bucher's method (this J., 1917, 451) of fixing atmospheric nitrogen by passing the gas through a mixture of iron powder, charcoal powder, and sodium carbonate in an electrically heated tube the following conclusions have been drawn: (1) Iron powder is an effective catalyst. (2) The yield of sodium cyanide depends upon the proportions of the materials, the temperature, and the duration of the heating, the latter depending upon the velocity of the current of nitrogen. (3) A suitable ratio for the raw materials, iron, charcoal, and sodium carbonate, is 2:2:1 or 2:2:1.35. (4) From 820° to 950°C . is a suitable temperature. Under these conditions it is possible to obtain 75% of the theoretical yield of sodium cyanide in a horizontal furnace. The use of yellow and red iron oxides (containing about 40% of silica) as a catalyst, was unsuccessful, possibly owing to the formation of soluble sodium silicate.—C. A. M.

Sodium peroxide; Determination of active oxygen in —. J. Milbauer. J. prakt. Chem., 1918, 98, 1–8.

METHODS depending on the liberation of hydrogen peroxide by water, followed by titration with potassium permanganate, and on the treatment of sodium peroxide with potassium iodide and potassium bicarbonate and titration of the liberated iodine with sodium arsenite give low results, whilst measurement of the oxygen liberated by water in the presence of cobalt nitrate gives high results. The following processes yield accurate results: (1) Water (100 c.c.) is mixed with concentrated sulphuric acid (5 c.c.) and chemically pure boric acid (5 grms.); sodium peroxide (0.5 gm.) is added gradually to the mixture which is kept briskly shaken, and the liberated hydrogen peroxide is titrated with potassium permanganate. The low results given by the older permanganate method are to be attributed to the catalytic decomposition of a portion of the hydrogen peroxide by the manganese sulphate formed during the titration. (2) Sodium peroxide is introduced gradually into a solution of potassium iodide (2 grms.) in dilute sulphuric acid (1 in 20; 200 c.c.); the iodine is titrated with standard sodium thiosulphate. The results agree with those obtained by the permanganate method. (3) Sodium peroxide (0.2–0.3 gm.) is mixed with about 10 c.c. of copper sulphate solution (0.05%) in a small flask connected to a nitrometer; the flask is shaken, and decomposition is completed within a minute, when the liberated oxygen is measured. The gas evolved contains about 0.32% of carbon dioxide and 0.08% of hydrogen. With cobalt nitrate as catalyst, the results are invariably high; the author considers that this may indicate the presence of an oxide higher than the peroxide. The action of the atmosphere on sodium peroxide has also been investigated; moisture appears to be more active than carbon dioxide in causing decomposition.—H. W.

Barium dioxide; Decomposition of — and the reactivity of the resulting barium oxide. J. A. Hedvall. *Z. anorg. Chem.*, 1918, **104**, 163–168.

THE decomposition of barium peroxide into barium oxide and oxygen is an endothermic reaction and its course can be readily followed by recording the heating curve. The arrest point in the curve is at 795° C., this being the temperature at which the vapour pressure of the evolved oxygen is equal to one atmosphere. In presence of catalysts, such as copper oxide, the decomposition starts at a much lower temperature and is continued over a considerable range. In presence of silica, especially amorphous silica, the reaction becomes exothermic, as shown by the heating curve. The heat evolution is attributed to the formation of a barium silicate, owing to the great reactivity of the barium oxide at the moment of formation. (See also *J. Chem. Soc.*, Jan., 1919.)—E. H. R.

Alkali iodides; Action of chlorine on —. W. N. Rae. *Chem. Soc. Trans.*, 1918, **113**, 880–884.

WHEN the carefully dried iodides of the alkali metals are subjected to the action of a current of dry chlorine the gas is absorbed with the formation of compounds of the type, $MICl_2$. The curves obtained by plotting the increase in weight against time afford no evidence of the formation of the intermediate compound, $MICl$. The rate of absorption of the chlorine bears no obvious relation to the stability of the resulting compound, but comparison is rendered difficult by the fact that traces of water increase the rate. In the case of lithium iodide, the experiments were made with the crystalline hydrate $LiI \cdot 3H_2O$, but the same proportion of chlorine was found to be absorbed as in the case of the anhydrous iodides.—H. M. D.

Cupric hydroxide; Solubility of — in sodium hydroxide and potassium hydroxide. Justin-Mueller. *Comptes rend.*, 1918, **167**, 779–780.

AN aqueous solution of sodium hydroxide having sp. gr. 1.345–1.370 (37°–39° B.) or of potassium hydroxide having sp. gr. 1.452–1.498 (45°–48° B.) will just dissolve 0.78 gm. of cupric hydroxide in 100 c.c., giving a bright blue solution which does not give a precipitate when boiled direct or after dilution. If a more dilute alkali solution be used to dissolve the cupric hydroxide, a solution is obtained which is not stable when further diluted and subsequently boiled.—W. G.

Zinc chloride; Dissolving — and several suggested solvents. J. C. and B. L. DeG. Peacock. *Amer. J. Pharm.*, 1918, **90**, 706–717.

THE formation of zinc oxychloride when zinc chloride is dissolved in water is accompanied by the liberation of hydrochloric acid; the addition of boric acid or ammonium chloride prevents this decomposition of the zinc salt. Camphor water dissolves a small quantity of zinc chloride, yielding a clear solution, but the solution becomes turbid when the quantity of the salt exceeds 10 grains per oz.—W. P. S.

Antimonic acids and antimonates. G. Jander. *Kolloid Zeits.*, 1918, **23**, 122–144.

THE properties of the antimonic acids vary according to the method of preparation and previous treatment. Soluble tri- and tetra-antimonic acids are hydrosols of low stability. The difference between the various antimonic acids is only that due to difference in the size of the particles. Ortho-, pyro-, and meta-antimonic acids are not capable of existing in the free state. The amor-

phous and gum-like antimonates are produced by the adsorption of alkali hydroxide from dilute solution and do not constitute true salts. Concentrated solutions of alkalis dissolve antimonic acids, and on careful evaporation at low temperatures definite antimonates may be crystallised out. In this way the salt, $1.71K_2O \cdot Sb_2O_5 \cdot 8H_2O$ has been obtained. (See also *J. Chem. Soc.*, Jan., 1919.)

—J. F. S.

Rare earths. VIII. Separation of yttrium and erbium; the ratio $Er_2O_3 : 2ErCl_3$. E. Wichers, B. S. Hopkins, and C. W. Balke. *J. Amer. Chem. Soc.*, 1918, **40**, 1615–1619.

THE nitrate fusion method is very efficient for separating erbium and yttrium and is much better than any of the newer methods, although the cobaltcyanide and the nitrite precipitation methods (this *J.*, 1916, 736, 925, 1259) are both good, the latter being the more practicable and efficient. Erbium oxide prepared by igniting the oxalate always contains carbon dioxide and consequently may not serve as the basis of the atomic weight determination of erbium. (See also *J. Chem. Soc.*, Jan., 1919.)—J. F. S.

Scandium from a Brazilian source. C. James. *J. Amer. Chem. Soc.*, 1918, **40**, 1674.

BRAZILIAN zirconia is shown to yield residues which contain notable quantities of scandium fluoride.

—J. F. S.

Hydrosols; Influence of filtration on —. T. Malarski. *Kolloid Zeits.*, 1918, **23**, 113–122.

THE effect of filtration on positive colloids like ferric hydroxide and negative colloids like silver, when the latter have had their velocity in an electric field reduced by the addition of electrolytes, is to reduce the velocity of migration in an electric field and to increase the stability of the sols. The experiments were made with filters of paper, fat-free cotton, sand, and glass wool. (See also *J. Chem. Soc.*, Jan., 1919.)—J. F. S.

Carbon monoxide, carbon dioxide, sulphur dioxide, and free sulphur; Equilibrium between —. J. B. Ferguson. *J. Amer. Chem. Soc.*, 1918, **40**, 1626–1644.

CARBON monoxide and sulphur dioxide react at temperatures between 1000° C. and 1200° C. to form carbon dioxide and free sulphur, with possibly traces of carbon oxysulphide in those mixtures which are rich in carbon monoxide. The equilibrium constants for these temperatures have been determined. (See also *J. Chem. Soc.*, Jan., 1919.)

—J. F. S.

Carbon dioxide factories; Separation of potassium sulphate from the potash liquors of — and process for preventing the formation of this salt. E. Luhmann. *Z. ges. Kohlenindustrie*, 1917, **23**, 471–472, 483–486. *Z. angew. Chem.*, 1918, **31**, Ref., 331.

THE potash liquors employed in carbon dioxide factories accumulate impurities, the chief of which is potassium sulphate, derived from sulphur dioxide present in the gas. In course of time the accumulation of sulphate becomes sufficiently large to interfere with the efficiency of the liquor and obstructions may occur in the plant through the crystallisation of the sulphate in the cooler portions. The sulphate may be removed by evaporating the liquor, but it is far better to avoid its formation. This may be done by passing the gas through a scrubbing tower packed with limestone.

If the scrubbing is performed by a weak solution of sodium carbonate instead of water, the removal of the sulphur dioxide is more complete, or if soda is not available, a suspension of chalk may be used.—J. F. B.

Sulphur in ores. Paul. See X.

Potassium bichromate. McCrosky. See XXIII.

PATENTS.

Ammonia; Distillation and recovery of — from ammoniacal liquor and apparatus therefor. G. Wilton, London. Eng. Pat. 120,596, 11.10.17. (Appl. 14,745/17.)

Hot spent liquor from ammonia stills, which contains a small residual proportion of ammonia, is led from the still through an intermittent automatic valve into a horizontal container which is maintained under reduced pressure, and may, if desired, be heated, e.g. by steam coils. The spent liquor is withdrawn continuously from the receiver through a trapped outlet. The ammonia passes through an outlet pipe into the bottom of a reflux condenser and concentrator, the lower part of which contains superposed trays and hoods similar to those of a fractionating column, the upper part containing a number of vertical tubes cooled by water. Condensed liquor flows back to the container through a trapped pipe, and uncondensed vapour passes out of the top of the condenser and through a water-cooled coil condenser. The ammonia liquor condensed therein flows down a long fall pipe into a receiver, and is of better quality than that obtained from the stills. A vacuum pump is connected with the ammonia receiver, but the effect of the condensers and fall pipe may be sufficient to maintain the required reduced pressure throughout the apparatus. If desired, less steam may be employed in the liquor stills, leaving more ammonia in the spent liquor to be recovered by the above means.—L. A. C.

Oxalates; Process for manufacturing —. L. W. Andrews, Chicago, Ill. U.S. Pats. (A) 1,280,622, (B) 1,281,117, and (C) 1,281,118, 8.10.18. Appls., (A and B) 8.5 and (C) 5.6.15.

ALKALI oxalates are manufactured by heating alkali formates together with a relatively small amount of (A) a polybasic alkali phosphate, (B) the trisodium salt of an oxy-acid of arsenic, or (C) a trialkali aluminate.—L. A. C.

Alunogene, halotrichite, [natural alum], or the like; Art of treating —. M. Barnett and L. Burgess, New York. U.S. Pat. 1,280,636, 8.10.18. Appl., 13.7.17.

THE soluble portion of alunogene, halotrichite, or natural alum is extracted and a solution of ammonium sulphate is added to the liquor, ammonium alum crystallising out, and iron sulphate remaining in solution. The ammonium alum is dissolved in water and the solution treated with ammonia, with the formation of aluminium hydroxide (which is removed and dried) and ammonium sulphate. Iron is precipitated as iron hydroxide from the original mother liquor by the addition of ammonia; the precipitate is removed and ammonium sulphate recovered from the solution.—L. A. C.

Aluminous materials of high silica content; Method of treating —. C. M. Hall, Niagara Falls, N.Y.; A. V. Davis, Pittsburgh, Pa., and H. H. Johnson, Cleveland, Ohio, Exors. U.S. Pat. 1,282,222, 22.10.18. Appl., 25.11.14.

A MIXTURE of aluminous material and common salt in the proportion of about 4 mols. of salt to 1 mol. of alumina is heated to 1600°–1700° F. (about 870°–925° C.) for about 4 hours in the presence of steam. Hydrochloric acid is generated and the residue is mixed with soda and lime and heated to 1300°–1400° F. (about 705°–760° C.) for 2–3 hours. The soluble sodium aluminate produced is separated from calcium silicate by leaching.

—L. A. C.

Alunite; Utilisation of —. R. Moldenke, Watchung, N.J. U.S. Pat. 1,282,273, 22.10.18. Appl., 1.5.18.

ALUNITE is digested with sufficient concentrated sulphuric acid to form a pasty mass, in a closed vessel at ordinary pressure and at a temperature at which free evolution of vapours takes place. The mixture is then allowed to settle, and excess sulphuric acid removed. The solid matter is dissolved and allowed to crystallise, and then calcined in an atmosphere of sulphur dioxide and oxygen to produce sulphuric acid and alumina.—L. A. C.

Permanganates; [Electrolytic] process of making —. M. Shocld, Assignor to Armour Fertilizing Works, Chicago, Ill. U.S. Pat. 1,281,085, 8.10.18. Appl., 14.6.17.

SODIUM manganate is converted into sodium permanganate by electrolysis in presence of an alkali salt other than a manganate, and potassium permanganate formed by the addition of a potassium salt to the solution.—L. A. C.

Calcium cyanamide; Process of making — and by-products from phosphate rock. E. W. Haslup, Bronxville, N.Y., Assignor to Haslup and Peacock, New York. U.S. Pat. 1,281,363, 15.10.18. Appl., 15.12.17.

A MIXTURE of phosphate rock with an excess of carbon is heated to about 1200° C. in a current of producer gas to drive off phosphorus and produce calcium oxide in the residue; the temperature is then raised to about 1500° C., the current of gas being continued, resulting in the formation of calcium cyanamide. Phosphorus pentoxide is prepared as a by-product by burning the phosphorus and oxides of phosphorus produced during the first part of the reaction.—L. A. C.

Alkali metal [sodium] cyanide and process of producing same. H. P. Eastman, Niagara Falls, Ont., Assignor to The American Cyanamid Co., New York. U.S. Pat. 1,282,395, 22.10.18. Appl., 10.3.17.

THE necessary amount of calcium cyanamide to form the required cyanide, together with calcium carbide, is added to molten sodium chloride, and the mass maintained above 900° C. until the reaction is complete. Above 1100° C. the reaction is more rapid.—L. A. C.

Kelp and like materials; Apparatus for incinerating —. S. R. Oppenheim, Keeler, Cal. U.S. Pat. 1,282,708, 22.10.18. Appl., 7.6.17.

A FURNACE for incinerating or charring kelp or like material is provided with a long horizontal combustion chamber with an ash-pit below. The combustion chamber is fitted with charging doors at

the top and firing doors in its side, and the ash-pit is trough-shaped and provided with a longitudinal conveyor by means of which the ash or char is moved along the trough and discharged. A gas outlet conduit has valved communication with the combustion chamber and with the ash-pit, whereby gases may be drawn directly from the chamber or from the ash-pit to cause a down draught through the material on the grate. The gas outlet is inclined downwards from the ash-pit to a washing apparatus for the gas, and an exhaust fan is provided to draw the gases through the conduit.

—L. A. C.

Flue-dust; Leaching — [to recover potassium salts]. W. G. Ilenshaw, San Francisco, and F. W. Huber and F. F. Reath, Riverside, Cal., U.S.A. Eng. Pat. 111,845, 14.11.17. (Appl. 16,741/17.) Int. Conv., 2.12.16.

SEE U.S. Pat. 1,220,989 of 1917; this J., 1917, 503.

Centrifugal dryer. U.S. Pat. 1,259,727. See I.

Composition for building. U.S. Pat. 1,279,119. See IX.

VIII.—GLASS; CERAMICS.

Optical glass melts; Formation of seed in —. A. E. Williams. J. Amer. Ceram. Soc., 1918, 1, 134—140.

THE formation of "seeds" or bubbles in glass is attributed to: (i) stirring the glass at too low a temperature, (ii) cooling the pot, without rapidly chilling the bottom (a conical layer of "seedy" glass extending upwards from the bottom of the pot is formed), (iii) raising one end of the pot above the bottom of the furnace ("seeds" appear in the other end), or (iv) evolution of gases during the slow cooling of the glass, particularly between 1200° and 700° C. Stirring during rapid cooling does not produce "seeds." The bubbles were found to contain a small quantity of carbon dioxide; the gas in them may be either a dissociation product or evolved from solution as the glass cools.—A. B. S.

Glass; Relation between the physical properties and chemical composition of —. VIII. Molecular compounds. E. W. Tillotson, jun. J. Amer. Ceram. Soc., 1918, 1, 75—93.

THE graph representing the variation of the refractive index or sp. gr. of a glass with the composition consists of one or more straight lines; if there is more than one line the points of intersection indicate the composition of molecular compounds. Glasses composed of mixtures of albite and anorthite give a single line graph, and therefore appear to contain no new compound. The graphs of mixtures of calcium and magnesium orthosilicates form three straight lines, intersecting at two points, indicating the formation of two compounds, $\text{CaMg}(\text{SiO}_3)_2$ and $\text{Ca}_2\text{Mg}(\text{SiO}_3)_3$. No indication is given of the formation of diopside, $\text{CaMg}(\text{SiO}_3)_2$ —the only double silicate which crystallises out of these mixtures. Graphs showing the relation of the refractive index to the composition of glasses of the system $\text{Na}_2\text{O}-\text{BaO}-\text{SiO}_2$ were plotted. With binary mixtures, the lines intersected at points corresponding to the compounds $\text{Na}_2\text{O}, \text{SiO}_2$ and $\text{BaO}, 2\text{SiO}_2$. With ternary mixtures the compounds $\text{Na}_2\text{O}, \text{BaO}, 3\text{SiO}_2$ and $\text{Na}_2\text{O}, \text{BaO}, 4\text{SiO}_2$ were indicated. The glasses corresponding to these compounds devitrify readily. The graphs for the

system $\text{Na}_2\text{O}-\text{CaO}-\text{SiO}_2$ indicated the existence of only one ternary compound, $2\text{Na}_2\text{O}, 3\text{CaO}, 7\text{SiO}_2$. A typical alkali-glass corresponding to $12\text{Na}_2\text{O}, 3\text{CaO}, 45\text{SiO}_2$ is therefore considered to be a solution of 1 mol. of $2\text{Na}_2\text{O}, 3\text{CaO}, 7\text{SiO}_2$, 10 mols. of $\text{Na}_2\text{O}, 2\text{SiO}_2$ and 18 mols. of SiO_2 . A high-melting line glass corresponding to $\text{Na}_2\text{O}, \text{CaO}, 6\text{SiO}_2$ is considered to be a solution of 1 mol. of $2\text{Na}_2\text{O}, 3\text{CaO}, 7\text{SiO}_2$, 1 mol. of $\text{Na}_2\text{O}, 2\text{SiO}_2$, and 9 mols. of SiO_2 . In the discussion, E. D. Tillyer pointed out that a hyperbolic curve fits the experimental results equally as well as intersecting straight lines, and that such a curve does not indicate the formation of any of the suggested compounds.—A. B. S.

Glassware; Effect of heat on chemical —. R. G. Sherwood. J. Amer. Chem. Soc., 1918, 40, 1645—1653.

WHEN glass is heated there are two distinct kinds of gaseous evolution, viz.: that resulting from adsorbed material, which is readily removed at temperatures below 300° C., and that resulting from a decomposition of the glass itself. The latter effect becomes important at 400° C. for the softer glasses and at 500° C. for the harder glasses. The most important constituent of the decomposition products (water, carbon dioxide and monoxide, hydrogen, nitrogen) is water, which constitutes practically the only product at temperatures near the softening point of glass. In regard to the use of glass vessels in experimental work, it is shown that if a hard glass which has been annealed, say at 600° C. for 2 hours, be subsequently heated, there is practically no evolution other than that of adsorbed gas until after the previous annealing temperature has been passed. (See also J. Chem. Soc., Jan., 1919.)—J. F. S.

Alabaster glass; history and composition. A. Silverman. J. Amer. Ceram. Soc., 1918, 1, 247—261.

ALABASTER glass is semi-opaque, and diffuses light transmitted through it without altering its colour, whereas opal glass alters the colour of the transmitted light. This effect is probably due to sulphates and chlorides acting as ionised electrolytes in the molten glass and precipitating various colloidal suspensions which would otherwise cause opalescence. Fluorides and aluminium compounds produce opalescence until sufficient quantities of sulphates or chlorides are introduced. Barium compounds increase the whiteness of the glass. Cryolite does the same up to a certain concentration, but in excess of this its action diminishes and finally disappears. Calcium phosphate, magnesium silicate, stannic oxide, arsenious oxide, zirconium oxide, and titanium oxide are also used for producing alabaster effects. A summary of the chief papers and a bibliography are given.—A. B. S.

Clays; Effect of electrolytes on some properties of —. H. G. Schurecht. J. Amer. Ceram. Soc., 1918, 1, 201—216.

THE cross-breaking strength of dry clays may be increased by the addition of 0.8—3% of the following electrolytes to the plastic clay, the first-named being the most effective: sodium hydroxide, sodium silicate, sodium carbonate, tannic acid, and calcium hydroxide. Small percentages of sulphuric acid decrease the strength of Kentucky ball clay. The addition of caustic soda, sodium silicate, or sodium carbonate adversely affects the moulding of the bodies, and the ware cracks more easily when drying. Calcium hydroxide and tannic acid do not affect the moulding. Sulphuric acid up to 2% improves the moulding properties of the bodies, but is harmful in larger proportions. The addition of

alkali to ball clay blackens it and lowers the percentage of water necessary for the development of plasticity. The addition of 1–2% of alkalis reduces the shrinkage of mixtures of equal parts of clay and flint, except when Georgia kaolin is used. Small quantities of sulphuric acid increase the shrinkage and large ones reduce it. Tannic acid and calcium hydroxide increase the shrinkage. The addition of alkalis and acids increases the density of dry mixtures. Up to 1% of calcium hydroxide increases the density, but larger amounts reduce it. Alkalis reduce the porosity and acids increase it, but calcium hydroxide always increases it. Small percentages (below 0.8%) of caustic soda reduce the burning shrinkage at cone 01 (1080° C.), but larger quantities increase it. At cone 8 (1250° C.) the electrolytes previously mentioned increase the strength of the pieces burned and in the same order of effectiveness, with the exception of calcium hydroxide, the action of which was not examined.—A. B. S.

Clays; Bonding strengths of — between normal (atmospheric) temperature and red heat. C. W. Saxe and O. S. Buckner. J. Amer. Ceram. Soc., 1918, 1, 113–133.

Various clays were mixed with three times their weight of alundum of No. 60-mesh, made into briquettes, dried under various conditions, and their tensile strengths at various temperatures determined. The strength of a clay which has been dried to constant weight at 110° C. is only a rough measure of its strength under manufacturing conditions, and does not afford a practical means of distinguishing similar clays with regard to their behaviour in commercial dryers. Clays which have not been completely dried show great dissimilarities in their affinity for water. The presence of a small proportion of water causes some clays to lose far more strength than others. The strength of hot clays between 110° C. and red heat is lower (for the first 200°–300° C.) than the strength of the same clays after thorough dehydration at 110° C. followed by subsequent cooling. During dehydration the strength of clays either increases or remains constant, independent of the temperature. Generally, the clays which are strongest after drying at 55° C. and then cooling, are also strongest at temperatures between 110° C. and 25° C., so that their strength under the former condition is a rough measure of that under the latter. No relation has been observed between the tensile strength and the loss of weight on drying the clays or their porosity.—A. B. S.

Terra-cotta bodies; Use of furnace slag as grog in architectural —. R. H. Minton. J. Amer. Ceram. Soc., 1918, 1, 185–200.

ARCHITECTURAL terra-cotta is very liable to a form of cracking known as "dunting." The author attributes this to the use of grog of an unsuitable character. The substitution of granulated acid furnace slag for grog in suitable proportions offers no exceptional difficulty; it costs about half as much as sagger grog, is lighter in weight, and abundant supplies are available. Bodies made of slag offered greater resistance to repeated "freezing" and to the sodium sulphate test. Only acid slags can be used, as the free lime in basic slags would cause disintegration of the terra-cotta. Metallic iron in the slag causes trouble, but it may probably be removed by a magnetic separation. It is suggested that the use of slag may prevent terra-cotta from "dunting." In the discussion, E. C. Hill suggested that the sodium sulphate test used by the author would not produce the fine hair cracks characteristic of dunting and that this defect may

be avoided by suitably controlling the nature, size, and proportion of the grog used, and by cooling very slowly below 650° C.—A. B. S.

Terra-cotta; Polychrome decoration of — with soluble metallic salts. H. Wilson. J. Amer. Ceram. Soc., 1918, 1, 353–366.

THE colour is applied to the glazed terra-cotta in the form of a solution of a soluble salt in water or in a mixture of glycerin and alcohol, a suitable dye being added so that the painted areas may show distinctly. As some chlorides and sulphates attack the carbonate in the glaze, it is often preferable to use nitrates or acetates. The painted ware is set in ordinary terra-cotta kilns and burned to cone 6–7. Good blues are produced in this way with cobalt sulphate, using 0.5–30 grms. per 100 c.c. of water. In glazes containing zinc oxide, good "taus" and browns are obtained with chromium salts. The greens from chromium salts in zinc-free glazes are unreliable. Good greens are obtained with uranium nitrate 6 grms., cobalt sulphate 1–3 grms., alcohol 10 c.c., and glycerin 10 c.c. Uniform light pinks are produced with tin chloride 20 grms., saturated solution of chromium acetate in alcohol 16 c.c., glycerin 10 c.c., and alcohol 9 c.c. Fair browns are made with manganese sulphate 10 grms., alcohol 10 c.c., and glycerin 10 c.c. More dilute solutions produce good grays. Nickel sulphate produces light purple and gray with some glazes and brown with others. Iron chloride gives variable red-browns. Cobalt sulphate and iron chloride in the ratio 5:6 to 1:10 gives violet and blue-grays. The following colours may be used on an ordinary white slip but do not develop so brightly as in glazes. Strong solutions of uranium salts give gray-brown colours. Uranium and cobalt salts give blues and green-blacks. Iron salts give buffs and red-browns. Manganese gives grays, browns, and blacks. Rutile and glycerin gives good light buffs and buff-browns. Copper sulphate gives shades ranging from light green-grays to black. Nickel gives good browns. The method is in regular use on a large scale in one works.—A. B. S.

Tunnel kiln; The Zwermann — and its operation. C. H. Zwermann. J. Amer. Ceram. Soc., 1918, 1, 262–266.

AN oil-fired tunnel kiln, 352 ft. long, 6 ft. 4 in. wide, and 6 ft. 6 in. high from the top of the trucks to the arch, contains 19 tanks (each 7 ft. 7½ in. long) in the preheating zone, 8 in the firing zone, and 18 in the cooling zone. The chief features of the oven are a fan to create the draught, a second fan to draw cold air through the hollow arch and side walls of the cooling zone of the kiln and then through the ware to be dried and preheated, and a pressure blower which forces air through recuperators in the side walls of the cooling zone and thence to the oil-burners. The interior of the tunnel is free, the spaces between the goods on two successive trucks serving as combustion chambers.—A. B. S.

Porcelain; Use of dense solutions in determining the structure of —. H. Spurrier. J. Amer. Ceram. Soc., 1918, 1, 287–290.

PORCELAINS may be graded by immersing the sample first in a dense solution of acid nitrate of mercury diluted so as just to float a properly-fired piece and to allow an underfired piece to sink, and afterwards in a similar solution diluted so as to allow a properly-fired piece to sink and an overfired piece to float. After immersion the sample may be washed with water, any yellow deposit which may occur being removed with a little acetic acid. The glaze is usually too thin to affect the accuracy of the method.—A. B. S.

[Salt] glaze reduction; Phenomena in — H. B. Henderson. J. Amer. Ceram. Soc., 1918, 1, 148–159.

SAMPLES of salt-glazed sewer pipes examined under the microscope all contained brown to black crystalline hexagonal plates, amber-coloured when separated and viewed by transmitted light, and resembling the ferric oxide in aventurine glaze. The crystals were attracted by a magnet and were 0.0026 to 0.017 mm. in diameter. The glazes contained about 0.01% of carbon, and the author regards the presence of carbon as essential for formation of the crystals. The colour of "flashed" brick only occurs on those faces exposed to the flame. On reburning "flashed" bricks in a normal or oxidising kiln atmosphere, the "flash" disappears. The "flashed" portions all contained similar hexagonal plates, the number of which increased progressively in samples drawn during the cooling. Reducing conditions are necessary for inducing the formation of the crystals, but the crystallisation continues under oxidising cooling conditions following the production of superficial fusion. In producing "flashed" bricks the ware is first subjected to reducing conditions, but if these are continued to the end the surface of the bricks is merely blackened. If, however, an oxidising period follows the reducing one, surface fusion commences, and if the reduction and oxidation are continued alternately and are followed by slow cooling the crystals are formed. The intense colour is probably an optical effect due to several modifications of crystals containing or consisting of iron oxide. The "fire flashed" colour and that of salt glaze are not, however, due to iron alone. In the subsequent discussion, C. F. Binns suggested that the formation under reducing conditions of ferrous silicate, which could afterwards be oxidised to ferric silicate, explained all the observed phenomena.—A. B. S.

Green glaze; A cobalt-uranium — for terra-cotta. H. Wilson. J. Amer. Ceram. Soc., 1918, 1, 238–246.

A GREEN glaze of deeper shade than is produced from chromium compounds was prepared by adding 3% of cobalt sulphate and 6% of uranium oxide to a matt glaze with the formula, 0.261 K₂O, 0.306 CaO, 0.294 ZnO, 0.083 BaO, 0.057 MgO, 0.384 Al₂O₃, 2.08 SiO₂, which matures at cone 3–7 in a commercial kiln. The use of an ordinary cobalt stain instead of the sulphate produced a mottled glaze. This was absent when a bright glaze with the formula, 0.238 K₂O, 0.354 CaO, 0.210 ZnO, 0.144 BaO, 0.055 MgO, 0.428 Al₂O₃, 2.90 SiO₂, maturing at cone 4–7, was substituted for the matt glaze. In the discussion R. H. Minton stated that the addition of a little rutile prevents the irregularity in colour.—A. B. S.

Frits [for enamels]; Effect of the degree of "smelting" on the properties of — E. P. Poste and B. A. Rice. J. Amer. Ceram. Soc., 1918, 1, 221–237.

THE materials to be fritted were placed in a pre-heated tilting furnace and the time required for the mixture to be uniformly fused was taken as unity. Samples were withdrawn after the following unit times: 1, 1½, 2, 2½, 3, and 3½ and designated A–F respectively. Although fluorspar was an ingredient of the original mixture, none of the frit contained any fluorine. The percentage of silica in the frit increased rapidly at first and more gradually on prolonged heating; that of the soda and boric oxide diminished somewhat less rapidly; the alumina, lime, and potash remained fairly constant. At point B (double unit time of

heating) the composition of the batch closely resembled the theoretical composition of the frit, but on further heating the composition changed considerably from that anticipated, the silica showing an increase, the soda and boric oxide a large, and the lime and alumina a slight, reduction owing to volatilisation. These changes produce an objectionable rise in the maturing point of the glaze, but favourably increase its range of deformation. The computed coefficient of expansion of the frit drops rapidly during the heating until 4 unit time is reached, after which it remains constant on further heating, but is then so low as to induce "shivering" or "flaking." Prolonged heating increases the resistance of the frit to acid, but also makes it much more brittle. In the discussion, it was pointed out that the results were vitiated by the authors rejecting the harder portions of frit and only using the finest of the ground material.

—A. B. S.

Enamels for cast iron; Ground-coat — H. F. Staley. J. Amer. Ceram. Soc., 1918, 1, 99–112.

A SATISFACTORY, glassy ground-coat should melt at a dull red heat, should be able to dissolve any oxides or foreign matter on the surface of the metal, and to flow into the minute pores of the metal so as to produce a good bond; it should not blister or volatilise at the temperature used in enamelling. Such ground-coat enamels are chiefly made by fritting a mixture of flint or sand, felspar, borax, red lead, and sodium nitrate. The borax is used to dissolve iron and other oxides; lead oxide produces fluid enamels of great strength. Cobalt oxide and other substances are sometimes added to increase the adhesion, but they are of doubtful value. Clay is invariably added to the ground frit to facilitate the suspension of the particles in water. Its action is improved by the addition of magnesium sulphate or chloride, which reduces the excessive alkalinity of the frit, and also forms a flocculent precipitate of magnesium hydroxide. Ammonium carbonate or borax may be used in place of the magnesium salt. The addition of a sulphate is undesirable, but the small proportions of magnesium sulphate generally used appear to be harmless. Magnesium oxide and carbonate and calcium hydroxide and carbonate are objectionable, as they do not melt in the enamel and their subsequent hydration may cause spalling. The comparative fusibilities of enamels may be roughly calculated from their composition by reducing the batch weight to 1000 lb. (melted) and comparing the "flint equivalents" or the number of pounds of flint which would have been used if flint had been the only refractory ingredient of the enamel, assuming that 100 parts of felspar may be replaced by 66.66 parts of flint or 40 parts of clay. Recipes for five typical ground-coat enamels are given as follows: (1) Flint 675, borax 390, sodium nitrate 35, red lead 52.5, cobalt oxide 3, clay 60 parts. (2) Flint 680, borax 170, sodium nitrate 50, red lead 170, cobalt oxide 0.85, clay 51. (3) Sand 275, potash felspar 435, borax 375, red lead 41, clay 57, cobalt oxide 3. (4) Sand 685, borax 335, sodium nitrate 30, red lead 85, cobalt oxide 2.7, clay 48, magnesium carbonate 3. (5) Sand 200, felspar 200, borax 390, sodium nitrate 30, red lead 100, magnesium carbonate 10, clay 325, cobalt oxide 1 part.—A. B. S.

Silica bricks; Laboratory testing of — R. J. Montgomery and L. R. Office. J. Amer. Ceram. Soc., 1918, 1, 338–352.

CHEMICAL analysis assists in determining the purity of the raw material but is of doubtful value for control purposes. Silica bricks which contain less than 2% of lime will have a weak bond; those containing more lime will not be highly refractory.

Alumina should not exceed 1.5%, as, in the form of clay, it is the most active of all the fluxing impurities. Iron has little effect on the refractoriness of silica bricks under oxidising conditions, but should not exceed 1.5%. The high colouring power of iron compounds has led to their importance being exaggerated. The deformation or refractoriness test is difficult, owing to the high viscosity of the softened material. The best silica bricks will not soften below cone 32; bricks made from chert or sand rock soften at cone 31–32. When a whole silica brick is maintained on end in a laboratory furnace for 24 hours at about 1600° C. it will usually soften and deform; the same brick will apparently withstand a higher temperature in an industrial furnace, but this is due to the fact that only the face of the brick is exposed to the full heat of the furnace, and the brick does not attain the maximum temperature throughout. The load test recommended by the Amer. Soc. of Testing Materials (25 lb. per sq. in. at a temperature of 1500° C.) is of doubtful value except in testing new materials; failures are usually due to a shearing or rupture of the bond and not to lack of refractoriness. Under normal conditions, silica bricks under a load of 25 lb. per sq. in. expand slowly up to about 200° C., very rapidly from 200° to 280° C., very slowly from 280° to 500° C., and then more rapidly until all further expansion ceases. Fireclay bricks, on the contrary, show an expansion more nearly proportional to the temperature, when heated under load. The cold crushing strength of silica bricks varies from 900 to 3700 lb. per sq. in., the average being 1800–2800 lb. per sq. in. The apparent sp. gr. of a 20-grm. sample after boiling 1 hour in water is useful to indicate underburning. The sp. gr. of well-burned silica bricks is about 2.42; that of under-burned about 2.36. Little use can be made of a determination of the porosity. In this discussion A. A. Klein stated that the proportions of quartz, cristobalite, and tridymite present are best ascertained by determining the sp. gr. of the brick.—A. B. S.

Plasticity of clays and limes. Kirkpatrick and Orange. See IX.

Balsam problem. French. See XXIII.

PATENTS.

Glass; Process and apparatus for controlling the outflow of — from melting tanks. W. J. Miller, Swissvale, Pa., U.S.A. Eng. Pat. 112,947, 24.1.18. (Appl. 1384/18.) Int. Conv., 25.1.17.

THE flow of glass from the discharge port of a melting tank between intermittent shearing operations is controlled and any surplus of glass is returned to the tank by a blast of air applied to the outer end of the discharge port. By this means, the chilled end or scar of surplus glass is re-melted. The introduction of air-bubbles into the molten glass is prevented by diminishing the pressure of the air as the glass becomes more fluid, and therefore flows more readily, the pressure being adjusted so that it is only just sufficient to return the glass to the tank and support it clear of the shears.—A. B. S.

Muffle leer [lehr]. H. M. Thompson, Washington, Pa. U.S. Pat. 1,281,713, 15.10.18. Appl., 1.6.18.

THE lehr chamber has a flat roof and floor, both built up of tiles. Over the front end of the lehr chamber is a muffle chamber and behind this and separated from it by a dividing wall is a regenerator chamber. Flues beneath the floor of the lehr

chamber communicate at their receiving ends with the muffle chamber and at their discharge ends with the regenerator chamber by way of flues in the side walls. Fuel gas and air are preheated by passing through pipes which extend through the regenerator chamber and discharge through passages in the dividing wall into the muffle chamber.

Refractory substances, artificial slate, and the like; Manufacture of —. G. Marsh, London. Eng. Pat. 120,471, 3.12.17. (Appl. 17,893/17.)

REFRATORY substances are made by mixing ground furnace slag, slate waste, infusorial earth, sand, flint, or ballast with Portland, Roman, or hydraulic cement to which plumbago may be added. Artificial slate is similarly made from slate dust, broken slate waste, crushed marble, granite, or the like with cement. In each case the dry materials are worked into a mortar by the addition of a solution of casein, blood, glue, gelatin, or other protein matter, with or without the addition of an alkali silicate, borax, boric acid, or ammonia. Suitable proportions for a refractory material are 100 lb. of water, 2 lb. of casein, 4 lb. of sodium silicate, and $\frac{1}{4}$ lb. of boric acid. For artificial slate 100 lb. of water, 8 lb. of casein, 2 lb. of sodium silicate, and $\frac{1}{4}$ lb. of borax may be used. The articles are cast or moulded under pressure and afterwards hardened in air or steam.—A. B. S.

Refractory material and process of making the same. H. A. Kennedy, Clearfield, Pa., U.S.A. Eng. Pat. 111,853, 26.11.17. (Appl. 17,454/17.) Int. Conv., 28.11.16.

SEE U.S. Pat. 1,238,020 of 1917; this J., 1917, 1095.

Coating process. U.S. Pat. 1,281,262. See X.

IX.—BUILDING MATERIALS.

[*Plasticity of clays and limes; Tests of — by the Bureau of Standards plasticimeter.* F. A. Kirkpatrick and W. B. Orange. J. Amer. Ceram. Soc., 1918, 1, 170–184.

EMLER's plasticimeter (this J., 1918, 514 A) may be used satisfactorily for distinguishing finishing from non-finishing hydrated limes and their relative behaviour when spread on absorbent surfaces. Mixtures of lime and 25% of gypsum, containing 48% of water, when made into a paste, gave a higher plasticity figure than other lime pastes. Tests made with clays which had been passed through a 100-mesh sieve showed similar results to those with lime, though the results were not comparable owing to different weights being used on the pendulum of the apparatus.—A. B. S.

PATENTS.

Non-conducting material. R. Illemann and J. A. Montgomerie, Glasgow. Eng. Pat. 120,691, 6.3.18. (Appl. 3901/18.)

ONE part, by measure, of calcined gypsum is gradually introduced into about six parts of water, and the mixture agitated until a plastic spongy mass is produced. The material may either be moulded into blocks of any suitable shape and dried, or may be applied direct to a boiler or other surface. On drying, a highly porous mass of gypsum is produced forming a very efficient insulator. If desired, a small proportion of slaked lime and/or sodium silicate may be added to the gypsum to neutralise any free acid; also, mineral or vegetable fibre may be added to strengthen the material.

—L. A. C.

Timber-preserving composition. L. A. Cretzinger and J. A. Workman, Cleveland, Ohio. U.S. Pat. 1,276,725, 27.8.18. Appl., 20.11.16.

HOLES are bored in the wood at suitable distances apart, and a mixture of sodium chloride (16 parts), arsenic trioxide (6 parts), and mercuric chloride (1 part) is introduced into the holes, which are then plugged, and the wood is left until it becomes impregnated with the preservative mixture.

Composition of matter for building and structural purposes. W. U. Jury, Shamokin, Pa. U.S. Pat. 1,279,119, 17.9.18. Appl., 10.6.18.

A COMPOSITION which is specially suitable for the floors of dyehouses and for acid vats consists of Portland cement, hydrated lime, liquid soap, and "sand" and "tailings" obtained from the clinker from anthracite coal.

Asphalt-like composition [for making roofing felt] and process of making the same. W. Savage, Philadelphia, Pa. U.S. Pat. 1,279,918, 24.9.18. Appl., 4.8.17.

SPENT fullers' earth from the refining of fatty oils is mixed with an asphalt-like material; the mixture may be subjected to an oil-hardening process, e.g., by heating it to 300°–700° F. (150°–370° C.) or by blowing air through the hot mass, or it may be mixed with sulphur and vulcanised. The product is specially suitable for the manufacture of roofing felt from paper or the like.

Insulating material; Thermotic — and process for making the same. J. K. Toles, San Francisco, Cal., Assignor to Union Fibre Co., Winona, Minn. U.S. Pat. 1,281,097, 8.10.18. Appl., 10.1.16.

INSULATING felt is made by reducing and partially purifying rice straw by cooking it in a weak alkaline solution, washing the resulting fibre, and mixing it with "uncooked vegetable tissue." The mixture is floated over a drain-screen, to form sheets of the desired size and thickness.—A. B. S.

Dry-kiln [for timber]. F. W. Rubin, Indianapolis, Ind. U.S. Pat. 1,281,212, 8.10.18. Appl., 5.3.18.

STACKS of timber are arranged with suitable passages through them. A current of air is passed through the stack, and the direction of the air current can be reversed. Jets of steam can be directed into the passage-ways, and a draught of steam or heated air can be produced throughout the whole of the stack.—J. S. G. T.

Oxy [chloride] salt [cement] composition and process of making the same. C. Catlett, Staunton, Va. U.S. Pat. 1,282,188, 22.10.18. Appl., 9.5.18.

A MIXTURE of commercial quicklime and sufficient calcium chloride to ensure chemical combination of all of the latter is caused to react in the presence of moisture, and the resultant oxychloride composition is allowed to set and become "relatively dry by the heat of hydration," and is then powdered.—L. A. C.

Fireproofing. Eng. Pat. 120,421. See I.

Washing gravel. U.S. Pat. 1,280,688. See I.

Artificial slate. Eng. Pat. 120,471. See VIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Magnetic iron alloys. Ber. Phys.-Techn. Reichsanstalt, 1917. Stahl u. Eisen, 1918, 38, 1043.

IN experiments made with a view to substitute chromium-steel for tungsten-steel, it was found that in the case of bar magnets of chromium-steel left undisturbed for 1 year the alteration of the magnetic moment in the best specimens amounted to only 0.1–0.3% and was within the limits of experimental error in nearly all the specimens examined during the latter half of the year. Suitable chromium-steels form an almost completely satisfactory substitute for tungsten-steel magnets, but the "efficiency" as measured by the product of the remanence and coercive force is not quite so high in the case of the best chromium-steels as in that of the best tungsten-steels.

Steel; Microstructure of hypo-eutectoid —. E. Atkinson. J. Roy. Micros. Soc., 1918, 265–274.

TENSILE tests made on the segregated portion of a rail and on a normal part of the same material gave the following results:

	Segregated	Normal
Max. stress, tons per sq. in. ...	48.2	44.5
Reduction of area, % ...	24.5	40.5
Elongation, % ...	16	24

The melting points of manganese and iron sulphides are given as 1620° C. and 950° C. and these sulphides thus freeze out as the first and last components respectively of the steel. Manganese sulphide occurs ultimately in globular form, and iron sulphide as intercrystalline films.—F. C. Th.

Manganese ores; Blast furnace treatment of low-grade —. R. Cordes. Stahl u. Eisen, 1917, 37, 494–497. Rev. Mét., 1918, 15, Extr., 310–312.

OWING to the increasing shortage of manganese, low-grade carbonate ores from the Siegerland district are now used. The material is hand-picked, or concentrated by an electromagnetic process; the value of the concentrate as a source of manganese is the smaller the higher its silica content. In smelting for pig-iron containing 3.5–4% Mn, the slag normally takes up 3% Mn, hence the manganese content of the metal decreases as the quantity of slag increases. Ore of the best quality assays SiO₂ 10, Fe 48, and Mn 9%; ores containing more than 30% SiO₂ must be concentrated.

—W. R. S.

Aluminium; Impurities in and purification of commercial —. Ber. Physik.-Techn. Reichsanstalt, 1917. Stahl u. Eisen, 1918, 38, 1041–1045.

THE impurities in 4 samples of commercial metal varied from 0.4 to 2%, chiefly iron and silicon, with lesser amounts of carbon and traces of sulphur, phosphorus, and nitrogen. The analytical methods for determining the impurities are as yet imperfect. The bulk of the aluminium may be eliminated as chloride by saturating the acid solution with hydrogen chloride. The purification of the commercial metal is difficult: silicon may be largely removed by fusion with nitre, but not the iron. The bulk of the latter can be dissolved by digesting the metal with 2% hydrochloric acid: borings containing 1% Fe gave 60% of purified metal with less than 0.1% Fe.—W. R. S.

Yttrium mixed metal; Preparation and properties of —. J. F. G. Hicks. J. Amer. Chem. Soc., 1918, 40, 1619–1626.

YTTRIUM mixed metal in the form of powder has been prepared: (1) by the action of sodium on a

mixture of the anhydrous chlorides of the mixed yttrium earths in a vacuum at 1100°C ., (2) by the electrolysis of the molten chlorides in a protected graphite crucible, using a carbon anode, and (3) by the electrolysis of a solution of the mixed oxides in fused cryolite. The last-named method is less efficient than the others. The first method affords a means of obtaining yttrium mixed metal of relatively high purity on a large scale. Reduction is effected in iron or nickel boats placed in seamless steel tubes, which are exhausted to 3–1 mm. and then introduced into a muffle previously heated to 1100°C . Yttrium chloride is lost in considerable quantities in all processes owing to its volatility at the working temperatures. The powdered metal has been sintered in a vacuum electric furnace, but the resulting mass easily disintegrates. The product has a mean "atomic weight" of 120 and contains 94.05–95.70% of metal, which corresponds to 37.5% of yttrium. It burns in the air at a dull red heat with a very bright light and yields a brown oxide. It is slowly oxidised by moist air at ordinary temperatures. It glows when heated in hydrogen, nitrogen, or carbon dioxide. It is readily attacked by water and does not amalgamate with mercury. It is pyrophoric but not so strongly as the alloy of cerium mixed metal and iron. The anhydrous chloride can be prepared on the large scale by heating the hydrated salt with ammonium chloride, whereby five of the six molecules of water are expelled, and then heating in a current of hydrogen chloride to expel the last molecule.—J. F. S.

Combustion; Economics of — in metallurgical operations. M. Escher. Stahl u. Eisen, 1918, 38, 977–982.

THE dissociation temperature of carbon dioxide in presence of incandescent carbon, the temperature at which carbon and oxygen combine to carbon monoxide, is 1300° – 1400°C . under practical conditions. It is the highest temperature obtainable by combustion of carbon monoxide (producer-gas), above which the monoxide and oxygen co-exist uncombined; but combination takes place as soon as the temperature falls below the dissociation point. Higher temperatures are attained by the combustion of carbon, hydrogen, or hydrocarbons. In open-hearth furnaces fired with producer-gas, in which the charge melts at about 1300°C ., carbon monoxide does not contribute to the raising of the temperature beyond that point, and after this temperature is reached combustion of the carbon monoxide takes place only in the regenerators; only the hydrogen and hydrocarbons present in the producer-gas are of value for raising the temperature further, hence the volume of gas blown in must be increased. The most economical manner of working would consist in melting down the metal with producer-gas and finishing the charge with a gas rich in hydrocarbons. In cupola furnaces, the oxygen-carbon monoxide mixture is formed at the tuyères, and combination to carbon dioxide takes place higher up in the shaft in contact with the cooler charge. Where 1300° – 1400°C . has to be exceeded in foundry work, the most economical appliance would be a cupola with an upper and lower set of tuyères. The iron would be melted down in the zone above the upper tuyères; in the lower part, where the furnace works as a gas-producer, the molten metal would become superheated.—W. R. S.

Sulphur; The value of — in ores, with special reference to blende-roasting contracts. R. Paul. Metall u. Erz, 1918, 15, 371–386.

IN high-grade sulphides (e.g., pyrites), sulphur has a positive value, while the contrary is the case

with medium and low-grade sulphide ores. Hence there must be an intermediate grade where the value of the sulphur balances the cost of roasting. The following values of one unit (10 kilos.) of sulphur in Spanish pyrites are arrived at by a series of calculations from contract data: In 40% pyrites, M.0-1975–0-3075; 45%, M.0-213–0-320; 50%, M.0-226–0-331; and in 55% pyrites, M.0-2360–0-3385. The roasting charge per unit of sulphur in blende is calculated from actual contracts at M.0-30–0-40 in ores containing 20% S; with increasing sulphur content the curves tend towards the zero line; but in only a few cases do the curves pass through the zero line indicating that the sulphur has a positive value. By calculating the cost and profits of sulphuric acid manufacture, the value of the sulphur in blende works out as follows (marks per unit):

15% S	–1.07955	35% S	–0.18765
20% "	–0.66747	40% "	–0.04934
25% "	–0.42022	45% "	+0.01933
30% "	–0.25386	50% "	+0.07428

The lower value of sulphur in blende as compared with pyrites is due chiefly to the higher working-cost, as blende must be dead-roasted, while pyrites is less thoroughly calcined with a view to a large output in acid. According to the contracts at present in vogue, the roasting charge paid to acid works is too small for low-grade blende, but too high for the higher grades.—W. R. S.

Enamels for cast-iron. Staley. See VIII.

PATENTS.

Metals [iron]; Anti-rust treatment of —. W. C. A. Mate, Garstang, Lancs. Eng. Pat. 120,619, 14.11.17. (Appl. 16,687/17.)

THE articles to be treated (e.g. shell noses) are heated to about 200° – 300°F . (93° – 149°C .), out of contact with sulphurous or other deleterious fumes, and then immersed in boiling linseed oil, drained, and cooled.—W. E. F. P.

Alloy steel. C. H. Wills, Detroit, Mich. U.S. Pat. 1,278,082, 3.9.18. Appl. 9.6.17.

MOLYBDENUM is added to the other ingredients of the steel to obtain a product which can be readily worked and has a tensile strength ranging from about 120,000 to 270,000 lb., and an elastic limit of 100,000 to 225,000 lb. Steel with these characteristics may contain substantially 0.2 to 0.35% carbon, 0.3 to 0.125% manganese, chromium in relatively large traces up to 1.2%, silicon from 0.15 to 0.35%, and molybdenum up to 1%.

—C. A. M.

Steel; Manufacture of —. S. S. Wales, Pittsburgh, Pa. U.S. Pat. 1,282,690, 22.10.18. Appl. 3.8.17.

SCRAP scrap is charged into an electric furnace, and molten metal is added to form a coherent heated mass, which is then melted and refined to the desired composition.—T. H. B.

Chrome-steel for magnets; Process for hardening —. Stahlwerke R. Lindenberg A.-G., Remscheid-Hasten. Ger. Pat. 308,291, 8.9.16.

THE finished pieces, used in the preparation of magnets, are brought to a temperature just below the critical point, then heated as quickly as possible to the hardening temperature above that point, and quenched in water.—W. R. S.

Ferromanganese; Production of — from low-grade manganiferous slag. H. Thaler, Herdorf. Ger. Pat. 307,393, 7.3.16.

THE slag is fused in a non-oxidising atmosphere in an electric furnace containing molten iron. Carbon is added to reduce the manganous oxide, and lime to increase the basicity of the slag and decompose manganese sulphide. The process is specially applicable to manganiferous blast-furnace slags having a basicity of 1–0.8.—W. R. S.

Puddling furnaces and process for making wrought iron. J. S. Withers, London. From P. F. Charles, B. F. Broderick, and E. A. Kirby, Girard, Ohio, U.S.A. Eng. Pat. 120,400, 6.9.16. (Appl. 12,632/16.)

Pig iron is melted in a continuously rotating furnace and "boiled" until graining of the metal occurs. The furnace is then transferred to a stationary balling furnace, and tilted to discharge its contents into the latter, in which puddling is completed by manual labour. Two boiling furnaces may be working in conjunction with one balling furnace, and the latter may be provided with a movable door in the crown to facilitate the transference of the partially treated metal. Mechanical means for operation are provided.

—C. A. K.

Furnaces; Heating, annealing, welding, and like —. E. J. W. Richards, Glasgow, and W. Kane, Port Talbot. Eng. Pat. 120,469, 3.12.17. (Appl. 17,844/17.)

FLUE gases from a furnace are caused to pass along a flue situated under the bed of the furnace and then through a downtake flue to the chimney. Air for combustion is conveyed through a flue separated from, and at a lower level than, that conveying the flue gases. The air duct is connected with an uptake flue in the side wall of an adjacent gas producer, and the air and gas for combustion meet in a mixing chamber prior to entering the furnace proper.—C. A. K.

Tempering ovens or furnaces. P. Carlisle and A. W. Harbord, Sheffield. Eng. Pat. 120,530, 4.7.18. (Appl. 10,957/18.)

A TEMPERING oven designed to utilise the heat contained in flue gases is provided with a grid on which articles to be tempered are placed. The hot gases enter the chamber below a perforated distributing plate which is fixed under the grid, and after passing around the material for treatment, leave by means of a flue provided with a damper to control the passage of the gases through the chamber.—C. A. K.

Furnaces for roasting ores and the like. E. Cortese, Alexandria, Egypt. Eng. Pat. 120,654, 3.12.17. (Appl. 17,892/17.)

In a furnace having an inclined roasting chamber through which the charge descends by gravity, the inclination of the upper portion of the chamber is greater than that of the lower portion, and the two parts are connected by a section having a parabolic or cycloidal profile. The charge is stirred, and its descent controlled, by means of vertical baffles; and the furnace is provided with water jets for hydrating the material, and with an adjustable discharge door for regulating the duration of the roasting process.—W. E. F. F.

Blast furnace use; Method of desiccating air for —. L. Goldmerstein (now L. Cammen), New York. U.S. Pat. 1,282,686, 22.10.18. Appl., 11.12.16.

Air is passed through a nearly saturated solu-

tion of calcium chloride at a temperature of 16° F. (–9° C.), the solution being circulated so as to include the passing air in its path of travel. The solution is then denuded of absorbed moisture, cooled, and circulated again.—T. H. B.

Aluminium alloy, and process of making same. L. S. Gardner, Detroit, Mich. U.S. Pat. 1,280,706, 8.10.18. Appl., 11.1.18.

AN alloy of aluminium, manganese bronze, and zinc is first made and is then melted with tin and aluminium; the approximate composition of the final alloy is Al 78, Cu 4, Sn 10, Zn 8, Mn 0.05 part.—T. H. B.

Metal [lead]; Reinforced —. Manufacture of pipes. C. M. Wales and C. Baskerville, New York, Assignors to The Metalco Co., Mount Vernon, N.Y. U.S. Pats. (A) 1,280,908 and (B) 1,280,909, 8.10.18. Appl., 5.2.16.

(A) FERROUS wire gauze, netting, or perforated sheet is dipped into a molten alloy of lead and antimony, the coating thus obtained serving as a binder between the netting and a covering of lead or lead alloy applied subsequently. (B) Pipes are made of a ferrous reinforcing member to which is secured a continuous sheet of lead by means of a binder of lead-antimony alloy.—T. H. B.

Ores; Process of concentrating —. T. A. Janney, Garfield, and C. M. Nokes, Salt Lake City, Utah. U.S. Pat. 1,281,018, 8.10.18. Appl., 28.7.17.

THE ground ore is mixed with water and the pulp is treated successively with a solution of gilsonite in oil, another oil with greater frothing power than the first, and an acid reagent, after which it is aerated to concentrate the metalliferous particles.—T. H. B.

Flotation process for concentrating ores. Hernadthaler Ung. Eisenindustrie A.-G., Budapest. Ger. Pat. 308,063, 5.10.16.

THE pulp mixed with oil and a current of air are circulated in the same direction in a chamber provided with an overflow for the froth carrying the values to be recovered.—W. R. S.

Zinc; Process of recovering —. F. Laist, Assignor to Anaconda Copper Mining Co., Anaconda, Mont. U.S. Pats. (A) 1,281,031 and (B) 1,281,032, 8.10.18. Appl., 29.1.18.

(A) Zinc is recovered from a siliceous calcine by leaching with an acid liquor, neutralising to precipitate silica, and separating the zinc-bearing solution from the insoluble matter. The latter is dehydrated and any zinc present is recovered by leaching the residue, the solution being used for leaching a fresh charge of calcine. (B) After leaching and precipitating the silica as in (A), the insoluble matter is separated and repulped with water and the resulting dilute solution of zinc separated. The two zinc-bearing solutions thus obtained are electrolysed separately, using insoluble anodes, to recover the zinc.—T. H. B.

Zinc; Furnace for refining —. W. Nestmann, Cöln-Kalk. Ger. Pat. 308,156, 27.9.17.

THE floor of the furnace slopes towards a lateral tap-hole leading into a well where the lead separates out; in this well is a float by means of which the tap-hole is automatically opened or closed according to the density of the metal in the well.

—W. R. S.

Coating metals, alloys, or other materials with protective coats of metals or alloys; Process of —. F. A. Vaughn, Milwaukee, Wis. U.S. Pat. 1,281,108, 8.10.18. Appl., 5.10.17.

A PLASTIC binding material, acting as an electrolytic insulating material (e.g., a solution of alkali silicate), is applied to the metal to be coated, and while the binding material is still plastic, it is coated by means of a spray of molten metal and subsequently hardened by exposure to carbon dioxide.—C. A. K.

Coating a transparent article with precious metal [gold]. F. O. Andres, San Francisco, Cal. U.S. Pat. 1,281,262, 15.10.18. Appl., 21.9.15.

A METALLIC deposit to which gold will adhere is applied to the surface of the article, and on this base is poured a solution containing gold chloride, potassium carbonate, and sugar, and the gold allowed to deposit without the application of heat. After removal of excess of the solution, the deposited film is toned with a mixture of a silver solution and copper nitrate.—T. H. B.

Metals; Apparatus for protecting from oxidation volatilised — used in coating processes. Neufeldt und Kuhnke, Kiel. Ger. Pat. 307,849, 31.1.15. Int. Conv., 11.8.14. Addition to Ger. Pat. 284,991.

THE metallic vapour passes into a receiver with an exit at the bottom, into which a stream of an inert gas has previously been passed, the air being thereby displaced. The gases issue from the top or bottom and pass through a layer of liquid. The chamber, which contains the articles to be coated, is thus trapped and the entry of fresh air prevented.—W. G.

Precipitating materials [metals] from solutions; Process of and apparatus for —. T. B. Crowe, Victor, Colo., Assignor to Merrill Metallurgical Co., San Francisco, Cal. U.S. Pat. 1,281,249, 8.10.18. Appl., 3.7.16.

ANY gas which may interfere with the precipitation is removed. After precipitation, the mixture of precipitate and liquid is transferred to a filter without contact with the air. (See also this J., 1918, 626 A.)—J. S. G. T.

Tungsten; Production of ductile —. C. A. Pfanstiehl, Waukegan, Ill., Assignor to Pfanstiehl Co., Inc., North Chicago, Ill. U.S. Pat. 1,282,122, 22.10.18. Appl., 12.7.15.

FINELY powdered tungsten is compressed to an ingot having a sp. gr. greater than 15.5, and the ingot is placed on a cradle of ductile tungsten, through which an electric current is passed, in an atmosphere of hydrogen, to heat the cradle and weld the ingot.—T. H. B.

Molybdenum or alloys thereof; Process of obtaining —. J. A. Holladay, Assignor to Electro Metallurgical Co., Niagara Falls, N.Y. U.S. Pat. 1,281,961, 15.10.18. Appl., 29.6.18.

WULFENITE concentrate or similar material is smelted to eliminate lead and produce a soluble molybdate slag, which is leached with a dilute solution of a calcium salt. From the resulting solution molybdenum is precipitated as calcium molybdate.—T. H. B.

Roll mills for ores. Eng. Pat. 113,067. See I.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Electric cells and batteries. R. S. Baxter, Tayport, Fife. Eng. Pat. 120,689, 5.3.18. (Appl. 3840/18.)

IN electric cells or batteries of the kind described in Eng. Pat. 103,020 (this J., 1917, 295), the negative element is formed of carbon or carbonaceous material to which a layer of sulphur or of carbon impregnated with molten sulphur is attached.

—W. E. F. P.

[Electrical] conductors; Process of making moulded —. S. Trood, Wilksburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,281,716, 15.10.18. Appl., 3.10.13.

FINELY-DIVIDED metal, e.g. copper, is amalgamated, the amalgam is mixed with lubricating material, e.g. finely-divided carbon, and the mixture is subjected to heat and pressure to remove practically all of the mercury.

Carbon electrodes; Manufacture of —. S. E. Sierin, Höganäs, Sweden. U.S. Pat. 1,282,475, 22.10.18. Appl., 16.10.17.

SEE Eng. Pat. 119,164 of 1917; this J., 1918, 706 A. The product is crushed, mixed with a binding material, such as coal tar, heated, and pressed into a suitable form.

Electrolytic gas generators. I. H. Levin, Newark, N.J., U.S.A. Eng. Pat. 111,483, 13.11.17. (Appl. 16,645/17.) Int. Conv., 18.11.16.

SEE U.S. Pat. 1,219,966 of 1917; this J., 1917, 511.

Electric furnace. J. O. Boving, London. U.S. Pat. 1,281,280, 15.10.18. Appl., 4.9.17.

SEE Eng. Pat. 109,465 of 1916; this J., 1917, 1183.

XII.—FATS; OILS; WAXES.

Oils; Negative catalysts in the hydrogenation of —. S. Ueno. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 898–939.

THE term "ratio number of hydrogenation" indicates the degree of hydrogenation of oils, $r = x/a$, where r represents the ratio number, x the difference between the iodine values before and after hydrogenation, and a the original iodine value. A comparison between the values of r and r' (the latter indicating the ratio number of a "blank" hydrogenation) shows whether a given substance acts as a negative catalyst or not. It was found that hydrogenation by means of a nickel catalyst was retarded by the soaps of potassium, sodium, lithium, magnesium, barium, beryllium, iron, chromium, zinc, cadmium, lead, mercury, bismuth, tin, uranium, and gold, whilst the soaps of calcium, strontium, aluminium, cerium, nickel, manganese, copper, silver, vanadium, thorium, and platinum had no effect upon the catalytic action. Nickel acetate, butyrate, stearate, lactate, oxalate, and succinate had also no influence on the catalytic hydrogenation. Copper hydroxide, ammonium molybdate, boric acid, arsenious acid, hydrochloric acid, and potassium hydroxide had a strong restrictive effect, zinc oxide and aluminium silicate had a slighter effect, and tungstic acid was almost inert. Fatty acids such as acetic, lauric, stearic, and oleic acids had no influence on the catalytic action, but glycollic and lactic acids, hydroxystearic acids, oxalic, succinic, and fumaric acids, and

hydroxy acids such as malic, citric, and tartaric acids, acted as negative catalysts. Sodium taurocholate had a restrictive influence, whilst nucleic acid had no effect. Powdered metals (not reduced by hydrogen) such as nickel, tin, zirconium, aluminium, and copper had no pronounced injurious effect, but iron, zinc, lead, and mercury acted as poisons. Sulphur, selenium, tellurium, and red phosphorus acted as negative catalysts, but the presence of a small amount of oxygen in the hydrogen had not a pronounced effect. Proteins, blood albumin, blood fibrin, and gelatin had a restrictive influence, but haemoglobin was inert. Glycerol and lecithin had a pronounced action, but cholesterol and squalene had no effect. Carbohydrates such as sucrose, dextrose, mannitol, and starch behaved as negative catalysts, but glycogen had no influence. Alkaloids such as morphine and strychnine were pronounced poisons, as were also potassium cyanide, amygdalin, and the gaseous and liquid products of the dry distillation of herring oil.—C. A. M.

Oils; Velocity of the hydrogenation of —. S. Ueno. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 749—762.

THE velocity of the hydrogenation of fatty oils by means of a nickel catalyst may be expressed by the equation of a reaction of the first order:—

$$k = \frac{1}{t} \ln \frac{a}{a-x}$$

—C. A. M.

Seed oil of Amorpha fruticosa. H. Nakatogawa. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 781—782.

THE seeds of the leguminous plant, *Amorpha fruticosa* (Manchuria), yielded 8.7% of a brownish-yellow oil with weak drying properties. It had the following characters:—Sp. gr. (15°/4° C.), 0.9423; acid value, 7.06; saponif. value, 182.5; iodine value (Wij's), 133.71; and n_D^{20} = 1.4845.—C. A. M.

Soap solutions; Hydrolysis of — measured by the rate of catalysis of nitrosotriacetoneamine. J. W. McBain and T. R. Bolam. Chem. Soc. Trans., 1918, 113, 825—832.

THE velocity measurements show that the alkalinity of solutions of sodium and potassium palmitate is very slight, the concentration of the hydroxyl ion being of the order of $N/1000$. This result agrees with that obtained in a previous investigation of the alkalinity by the electromotive force method. The observed concentration of the hydroxyl ion is quite insufficient to account for the electrical conductivity of soap solutions and precludes the widely held opinion that such solutions contain appreciable amounts of free fatty acid. All such fatty acid must be present in the form of acid soap, the formation of which may be due to chemical combination or to adsorption of the free acid. The alkalinity of the soap solutions decreases with falling temperature. (See also this J., 1918, 249 t.)—H. M. D.

PATENTS.

Cottonseed meats; Treatment of —. C. O. Phillips, New York. U.S. Pats. (A) 1,278,073, (B) 1,278,075, and (C) 1,278,076, 3.9.18. Appl. (A) 21.8.17, (B) and (C) 10.7.18.

(A) CRUSHED decorticated cottonseed is intimately mixed with a small amount (about 3 galls. per ton) of a dilute solution (about $\frac{1}{10}$ lb. per gall.) of sodium bicarbonate or other alkali carbonate, the mixture cooked, and the oil expressed. (B) A dilute solution of sodium carbonate (about 2½ oz. of the crystalline

salt, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, per gall.) is used for the admixture. (C) A dilute solution of lime water or milk of lime (containing about 5% of calcium oxide) is used instead of alkali carbonates.—C. A. M.

Soaps containing insoluble metallic compounds; Preparation of —. K. Endriss, Stuttgart, and H. Schuster, Lendsiedel. Ger. Pat. 307,681, 19.7.16.

WITH the object of obtaining products of increased detergent power and of saving fatty acids, the materials are mixed, before or during the manufacture of the soap, with considerable quantities of soluble metallic salts, such as those of magnesium, aluminium, and zinc, which are able to react with alkali to form insoluble compounds of weak basic character, and these salts are completely or partially decomposed with alkali. For washing and textile soaps the proportion of metallic salts should not be materially less than 10%, and for toilet soaps not materially less than 5%, calculated on the amount of fatty acids. The finished soap should contain little free alkali, preferably not more than 1 to 2% of the amount of fatty acids.—C. A. M.

Detergents containing ammonia; Preparation of from ammonium salts. A. Heckt, Kiel. Ger. Pat. 308,078, 3.5.17.

A DILUTE aqueous solution of sodium silicate is incorporated with an aqueous solution of ammonium chloride or carbonate to obtain a paste-like product. The addition of oxalic acid to either constituent promotes the formation of a paste, and increases the detergent power of the preparation. Quillaia bark extract, saponin, or the like may also be added to cause frothing.—C. A. M.

Soap substitute. J. Perl und Co. G.m.b.H., Berlin-Tempelhof. Ger. Pat. 308,609, 3.6.16.

MAGNESIA cement made by a hot method froths like soap and has frictional detergent properties. It is conveniently prepared from light magnesite, and before hardening is incorporated with magnesium carbonate, barium sulphate, kaolin, or other finely powdered substances.—C. A. M.

Asphalt-like composition. U.S. Pat. 1,279,918. See IX.

Animal substances. Ger. Pat. 308,152. See XV.

Treating cocoa, etc. Eng. Pat. 120,178. See XIXa.

Viscosimeter. U.S. Pat. 1,281,042. See XXIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Essential oil of Pinus thumbergii (Japanese oil of turpentine). Y. Shinosaki. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 763—774.

TURPENTINE from the Japanese pine, *Pinus thumbergii*, Parl., locally known as *kuromatsu* or *o-matsu*, consisted of 22.92% of essential oil and 73.36% of colophony, with 3.61% of moisture and 0.21% impurities. The essential oil, which was separated by distillation with steam, had the following characters: Sp. gr. at 15°/4° C., 0.8740; n_D^{20} = 1.4738; n_D^{25} = 1.4717; and acid value, 0.53. It was soluble in 8 vols. of 90% alcohol and 28 vols. of 80% alcohol. About 80% of the oil distilled between 154° and 169° C., and about 4% between 169° and 252° C. The fraction (15%) distilling

above 252° C. had sp. gr. 0.9241, $n_D^{25}=1.4993$; and $\alpha_D=+38.25$. By fractional distillation *in vacuo* three main fractions were obtained, viz. (1) about 73% of the original oil consisting of α -pinene; (2) a fraction containing camphene; and (3) a liquid tricyclic sesquiterpene boiling at 105°–106° C. (2 mm.), and having sp. gr. 0.9370 at 15° C.; $n_D^{20}=1.5055$; and $\alpha_D=+43.5$.—C. A. M.

PATENTS.

Colour. F. J. Baumgardner, Assignor to W. Hoyt and A. J. Hudson, Cleveland. U.S. Pat. 1,276,861, 27.8.18. Appl., 6.11.16.

FINELY-GROUND oyster shells are claimed as an efficient substitute for aluminium hydroxide as a base on which to precipitate aniline dyestuffs for the manufacture of pigments. For the production of a given tint less colour is required when oyster shells are used as a base than when aluminium hydroxide is employed.

Coloration method. B. D. Avis, Clarksburg, W. Va. U.S. Pat. 1,277,172, 27.8.18. Appl., 8.1.18.

AN improvement of the process described in U.S. Pat. 933,522 (this J., 1909, 1049). The surface to be coloured is coated with an ammoniacal solution of dimercuric ammonium nitrate or an alcoholic alkaline solution of a double mercury-alkali salt, and the double salt is precipitated by evaporation of the ammonia or alcohol respectively. Glass, porcelain, metal, wood, paper, etc. can be coloured by this method. The transparency of glass is not destroyed by the coloration.

Varnish and process of making the same. S. Satow, Sendai, Japan. U.S. Pat. 1,280,861, 3.10.18. Appl., 25.11.16.

VEGETABLE proteins are "glutinated" by an agent such as a dilute acid, a phenol is added as an antiseptic, and the product is employed for the preparation of a varnish, e.g. by emulsifying a solution of the gelatinised proteins.—J. F. B.

Inting composition and method of producing the same. S. Tamari, Tokyo, Japan. U.S. Pat. 1,281,702, 15.10.18. Appl., 19.1.17.

SEE Eng. Pat. 107,370 of 1917; this J., 1918, 188 A.

Ink; Writing —. M. Shinozaki, Nihombashi-ku, Japan. U.S. Pat. 1,282,302, 22.10.18. Appl., 5.6.17.

SEE Eng. Pat. 117,117 of 1917; this J., 1918, 554 A.

Disazo colour. U.S. Pat. 1,281,938. See IV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Viscosity of plantation —, its relation to the properties after vulcanisation and its significance in rubber testing. O. de Vries. Comm. Central Rubber Stat., Buitenzorg, Java, 1918, No. 9, 51 pages.

FROM a consideration of numerous tests made as part of the routine work of the Rubber Station, the conclusion is drawn that there exists no close relationship between the viscosity of a rubber and its tensile strength, rate of vulcanisation, or resistance to stretching at high elongations (i.e. "slope").—D. F. T.

Rubber; Influence of "rustiness" on the inner qualities of sheet —. O. de Vries and H. J. Hellendoorn, Comm. Central Rubber Stat., Buitenzorg, Java, 1918, No. 10, 1–12.

"RUSTINESS" arises from the action of aerobic micro-organisms on the serum of the rubber with intermediate formation of a jelly-like substance which does not consist of protein matter; it can be avoided by rapid surface-drying. "Rustiness" merely consists of a dry superficial film. No deterioration of the inner qualities of the sheet rubber could be detected other than the slight differences arising from the circumstances under which "rustiness" is produced.—D. F. T.

Rubber; Influence of heat on the inner qualities of —. O. de Vries and H. J. Hellendoorn. Comm. Central Rubber Stat., Buitenzorg, Java, 1918, No. 10, 13–34.

LATEX coagulated by heat gives a rubber of low viscosity and greatly increased rate of vulcanisation, but the tensile strength and "slope" are unaltered. Freshly rolled crêpe or sheet is unaffected by being soaked in water at 40° C. for 15 minutes, but with rise in the temperature the viscosity and, to a less degree, the rate of vulcanisation, and even the tensile strength exhibit a decrease. If coagulum becomes heated during rolling the viscosity undergoes a reduction, but the other properties are relatively little affected, whilst freshly rolled sheet when dried at 40°–50° C. gives exactly the same result as air-dried rubber, although at 60° C. a decrease is observed in rate of cure and in viscosity. Dry rubber when heated at 70°–100° C. undergoes a reduction in viscosity and tensile strength, but the rate of vulcanisation and "slope" are unaltered; the effect of heat in this case is considerably increased by the occurrence of oxidation.—D. F. T.

PATENTS.

Vulcanising process. C. E. Andrews, Assignor to The Walker Chemical Co., Pittsburgh, Pa. U.S. Pat. 1,280,940, 8.10.18. Appl., 27.2.18.

A VULCANISED rubber compound is obtained by heating the raw material together with sulphur and aminocymene.—D. F. T.

Rubber composition and method of producing the same. J. M. Weiss, New York, Assignor to The Barrett Co. U.S. Pat. 1,282,505, 22.10.18. Appl., 16.5.18.

A LIGHT-COLOURED, semi-solid to solid bitumen obtained by the destructive distillation of coal-tar pitch is mixed with the vulcanisable ingredient of the composition to be vulcanised, and the product subjected to vulcanisation.—L. A. C.

XV.—LEATHER; BONE; HORN; GLUE.

Jellies [gelatin]; Diffusion of electrolytes into —. I. Relationship between the distance of diffusion and the concentration. O. von Fürth and F. Bubnović. Biochem. Zeits., 1918, 90, 265–287.

FROM the study of the diffusion of chlorides into gelatin jellies containing silver nitrate, the relationship found was $d=mt^{\frac{1}{2}}k$, when d =diffusion distance in time t , k =concentration, and m and n are constants. (See also J. Chem. Soc., Jan., 1919.)

—S. B. S.

PATENTS.

Animal substances; Apparatus for the treatment of — [for recovery of glue and fat]. H. Goslar, Aix la Chapelle. Ger. Pat. 308,152, 5.9.16.

THE apparatus comprises an extractor and a fat separator, the latter consisting of two superposed chambers connected by tubes for the equalisation of the pressure and the transference of the glue solution from the upper to the lower. The bottom of the extractor is convex internally and is heated most strongly at the centre, it may be double-walled and heated by steam, or heating may be effected by solid fuel, in which case the base may be fitted with a metal plate thickened at the centre. —D. F. T.

Tanning. R. Bohn, O. Bally, and H. Wolff, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,281,494, 15.10.18. Appl., 30.12.16.

See Eng. Pat. 116,935 of 1917; this J., 1918, 521 A.

XVI.—SOILS; FERTILISERS.

Superphosphates; Rational preparation of —. A. Aita. Annali Chim. Appl., 1918, 10, 45—103.

Determination of free phosphoric acid and water.—In the system—phosphoric acid—calcium oxide—water—there is normally a solid phase consisting of mono- and dicalcium phosphates, and a liquid phase consisting not only of phosphoric acid and water (compare Pratolongo, this J., 1916, 1073), but also of monocalcium phosphate. The proportions of free phosphoric acid and dicalcium phosphate in the mixture depend upon the quantity of water which goes to form part of the liquid phase. For determining free phosphoric acid under these conditions aqueous solvents, alcohol, and ordinary ether are unsuitable since they have a hydrolytic action on the monocalcium phosphate. The use of anhydrous ether for the extraction of the free phosphoric acid prevents this hydrolysis, and reduces or eliminates the risk of removing part of the water of crystallisation of the solid constituents:—Two grms. of the superphosphate is extracted with anhydrous ether, the filtrate evaporated, and the residue dried in an oven at 40° C. The residue left after the treatment with ether is also dried at 40° C., then weighed and placed in a desiccator over sulphuric acid until again constant in weight. The first loss in weight gives the amount of water in the liquid phase (after taking into account the free phosphoric acid), and the second loss in weight gives the water of crystallisation of the solid constituents. In the case of superphosphates prepared from phosphorites the proportion of free phosphoric acid diminishes during storage. *Superphosphates of normal and abnormal composition.*—From experimental data the following conclusions have been drawn:—(1) The characteristic physico-mechanical properties of superphosphates depend upon the proportions of free phosphoric acid and water, considered together. (2) The content of water depends upon the concentration of the sulphuric acid used, whilst the content of free phosphoric acid depends on the relative proportions of the interacting substances and is independent of the temperature. Commercial superphosphates may be classified into two groups—normal and abnormal. To the first group belong bone superphosphates and mineral superphosphates prepared by rational methods; to the second group belong most commercial mineral superphosphates.

In products of normal composition the amount of water should not exceed 10 to 12%, whilst the free phosphoric acid should not exceed 1 to 2% (as P_2O_5), corresponding to 5 to 10% of the total soluble P_2O_5 . The presence of dicalcium phosphate is a criterion of normal composition. The fraction of phosphoric anhydride combined with the calcium in this form should be equivalent to that present as free phosphoric acid. In the case of bone superphosphates, which are prepared with a deficiency of sulphuric acid, this relationship between the free phosphoric acid and dicalcium phosphate is not found, owing to the fact that the tricalcium phosphate was not originally completely converted into monocalcium phosphate, but remained to a large extent in the form of dicalcium phosphate. The remainder of the soluble phosphoric anhydride is present as monocalcium phosphate. Mono- and dicalcium phosphates are mainly present in the hydrated form, whilst the calcium sulphate is present in the form of plaster of Paris rather than as anhydrite. The hydrated forms of these salts are produced by secondary reactions, at all events in the case of mineral superphosphates. Superphosphates of abnormal or defective constitution show a high proportion (over 12%) of water in the liquid phase, and contain more than 2% of free phosphoric acid (as P_2O_5), exceeding 10% of the total soluble P_2O_5 . They contain little or no dicalcium phosphate, and the anhydrous forms of the salts mono- and dicalcium phosphate and calcium sulphate predominate or are exclusively present. They show defective physico-mechanical properties varying with the proportions of water and free phosphoric acid, and are sometimes so pasty that they cannot be distributed. *Rational conditions of preparation.*—It is necessary to limit the proportions of water and free phosphoric acid. The evaporation of the water in the mass during the reaction varies directly with concentration and temperature of the acid, the temperature of the reaction, and the nature and chemical composition of the phosphorite. A high temperature of the acid is objectionable, since it promotes too rapid evaporation before the mass has become uniformly and completely mixed, and it is preferable to keep the temperature between 20° and 30° C. It is essential that the mixture should be kept in a paste-like form for a sufficient length of time, so that it can be uniformly distributed in the reaction chamber. The concentration of the acid to be used varies with the nature of the mineral phosphate and the moisture it contains. As a general rule acid of 54° B. (sp. gr. 1.600) is suitable for hard and lumpy phosphates, and acid of 55° to 56° B. (sp. gr. 1.615 to 1.635) for friable phosphates. The quantity of sulphuric acid required may be calculated from the composition of the mineral, the following table showing the coefficients for the principal components with different concentrations of acid:—

Sulphuric acid, °B.	53	54	55	56
Tricalcium phosphate	1.14	1.11	1.09	1.07
Calcium carbonate	1.46	1.43	1.40	1.37
Iron oxide (2), aluminium oxide (3)	3.34	3.25	3.20	3.12
Unestimated	0.12	0.11	0.10	0.09

The duration of the mixing should be kept strictly to the time required for complete and uniform admixture (e.g. about 15 to 20 secs.). The conversion of the phosphoric acid into soluble forms depends on various factors such as the nature of the phosphorite, its hardness and structure, its calcium carbonate content, the process of grinding, and the proportion of fine powder to granular matter. By the modern systems of grinding, superphosphates are prepared leaving at most 0.2 to 0.3% of insoluble phosphoric anhydride, whereas at one time this portion exceeded 1%. On the other hand, excessive fineness of the meal tends to cause undesirable

physico-mechanical conditions in the final product. Hard phosphorites yield products containing more free phosphoric acid than those obtained from friable phosphorites. This is due to the influence of the finer meal produced and the different structure of the grains upon the reaction. Hence in the case of hard and lumpy phosphorites it is advisable not to grind the material too fine. *Official (Italian) method of examining superphosphates.*—The official method which consists essentially in extracting the product with water, and digesting the residue with ammonium citrate solution, is inaccurate, since extraction with water causes more or less hydrolysis of the monocalcium phosphate according to the amount of free phosphoric acid in the sample. *Artificial drying of superphosphates.*—Hot and cold systems of drying superphosphates are employed. In the former the product is exposed to hot air at 80° to 150° C. for a definite time in suitable apparatus (revolving drums, etc.). The removal of water modifies the relationship between the three forms of phosphoric anhydride compounds, but in a different way for normal and abnormal superphosphates. In the case of normal products it also reduces the amount of free phosphoric acid, which will have reacted with a corresponding quantity of dicalcium phosphate to form monocalcium phosphate, thus improving the physico-mechanical condition of the product. In the case of abnormal products, however, containing excessive free phosphoric acid, the removal of water is slow and expensive, and there is much less reduction of free phosphoric acid owing to the deficiency or absence of dicalcium phosphate, so that the free phosphoric acid may even be relatively higher after the removal of water. The physico-mechanical properties of such products are not improved, and may even be deteriorated by the process. The second method of drying is to add inert absorbent material such as infusorial earth to absorb part of the water, or substances which will react with the excess of free phosphoric acid such as bone-ash or friable phosphates. (See also J. Chem. Soc., Jan., 1919.)—C. A. M.

PATENTS.

Fertiliser and insecticide. G. Truffaut, Versailles, France. Eng. Pat. 120,288, 3.12.17. (Appl. 17,900/17.)

THE fertiliser is a mixture of 40% of calcium sulphide, 20% of calcium sulphate, 20% of calcium phosphate, and 20% of heavy tar oils freed from bases and phenols. It acts as a partial steriliser of the soil and stimulates the formation of ammonia. —J. H. J.

Fertiliser materials; Process of making —. P. H. Carter, Savannah, Ga. U.S. Pat. 1,279,838, 24.9.18. Appl., 1.7.16. Renewed 17.7.18.

NITRE-CAKE is subjected to the action of tricalcium phosphate (e.g., phosphate rock) in the presence of water, and the product is allowed to act on "fertiliser stick" until the mass has dried and hardened.—J. H. J.

Fertiliser for seeds and plants; Physiological —. N. A. Barbieri, Rome. U.S. Pat. 1,282,170, 22.10.18. Appl., 11.3.18.

SEE Eng. Pat. 110,338 of 1917; this J., 1917, 1244.

Calcium cyanamide. U.S. Pat. 1,281,363. See VII.

Fertiliser. Ger. Pat. 307,575. See XIXa.

XVII.—SUGARS; STARCHES; GUMS.

Sugar; Measures taken in Java to prevent deterioration of stored —. L. G. L. Steuerwald. Archiv Suikerind. Ned.-Indië, 1918, 26, 879. Int. Sugar J., 1918, 20, 543–546.

THE effect of the conditions of warehousing sugar upon its keeping qualities has been studied in Java, where about 1,000,000 tons of the 1917 crop was stored during the rainy season of 1917–18 in buildings of varying construction. Stores with roofs constructed of tiles gave the worst results. Somewhat better results were obtained in stores with glass roofs, provided with windows; but corrugated iron, on account of its heat conducting property, proved even better. For the floors of the stores, sand proved unsatisfactory; and earthenware or tile floors, and also those of brick laid in cement, allowed moisture readily to pass upwards through them. It is concluded that to obtain the best results impermeable floors of asphalt or concrete should be used, the roofs and walls should be of corrugated iron, the bags should be piled on wooden blocks, e.g., railway sleepers, covered with a thatchwork of bamboo or rattan, permitting circulation of air beneath and between them, and a slow current of dry and moderately warm air should be conducted through the whole length of the building.—J. P. O.

Dextrin; Preparation of —. M. Yano. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 865–881.

Dextrin prepared by the following method is a suitable substitute for gum arabic, although not so adhesive. Ten parts of dilute nitric acid (5 parts of acid of sp. gr. 1.40, and 95 parts of water) is mixed with 100 parts of sweet-potato starch, and the resulting paste is dried at about 50° C., and then heated for about an hour at about 150° C. in a lacquered zinc pan in an iron heating box.—C. A. M.

PATENTS.

Sugar liquors; Treating —. G. W. S. Simpson, London, and R. F. Lyle, Greenock. Eng. Pat. 120,055, 24.7.17. (Appl. 10,629/17.)

SPHAGNUM or other moss is boiled in alkali, washed, and filled into vertical leaf filter-frames which are suspended in a tank into which the sugar liquor to be filtered is passed. The moss is retained in position by coarse wire screens which are covered with a cloth of open texture to retain slimy and coarse impurities. The sugar solution in the tank is drawn through the filters by a vacuum pump and when, owing to accumulation of impurities on the filters, the rate of filtration becomes too slow, the cloth is removed to be washed and a clean cloth inserted. When the moss requires to be cleaned, hot water is admitted to the tank and drawn through for a short time. Instead of a leaf filter, the moss may be placed on a rotary drum covered by an endless cloth. Radial pipes conduct the sugar solution to axial channels in the drum. A vacuum pump draws the liquid through the drum. As the drum revolves, the cloth leaves the drum above the level of the liquid and passes over a small roller in a washing tank, where it is sprayed with hot water before returning to the drum. The sugar liquor comes through the filter freed from suspended matter and is ready to be decolorised.—J. H. J.

Adhesive; Preparation of a non-drying —. H. Kühle, Darmstadt. Ger. Pat. 308,754, 16.2.17.

THE process described in Ger. Pat. 297,186 (this J., 1917, 895) is modified, in that the mixture of yeast

and molasses, or other saccharine material, is allowed to ferment in acid, neutral, or alkaline condition, either before or during concentration *in vacuo*. The fermentation is mainly at the expense of the yeast proteins, the molasses being relatively unchanged.—C. A. M.

Treating gums. Eng. Pat. 120,183. See VI.

Fodder from beet. Ger. Pat. 307,575. See XIXA.

XVIII.—FERMENTATION INDUSTRIES.

Wines; Damaged — [Vins tournés.] L. Roos. Ann. Falsif., 1918, 11, 300—308.

The alteration of wine by bacteria, producing *vin tourné*, may take place quite suddenly and for no apparent reason; the wine becomes turbid, a sediment forms, the colour is changed, and the volatile acids increase in quantity. The latter change is due to the decomposition of the tartaric acid, which is, apparently, converted into tartronic, lactic, acetic, and propionic acids and carbon dioxide. Wine which is badly attacked may be quite free from tartaric acid. The amount of tartaric acid present cannot therefore be used as a basis for the detection of added water in the wine. As a rule, the altered wine contains abnormally large quantities of mineral matter, particularly of potassium, since further amounts of potassium bitartrate are dissolved from the walls of the cask as the decomposition of the already dissolved tartrate proceeds. It is only when the total ash, its alkalinity, and the total potassium are all unusually low that watering is indicated.—W. P. S.

Diastase, peroxydase, and catalase; Relationship between — H. Maggi. Helv. Chim. Acta, 1918, 1, 433—451.

The simultaneous presence of peroxydase and catalase activity in many enzymes has been attributed by Woker (Ber., 1917, 60, 679) to the presence of an aldehyde group which unites with hydrogen peroxide to yield a secondary peroxide, $R\cdot CH(OH)\cdot O\cdot OH$, which has more powerful oxidising properties than hydrogen peroxide itself and which can also react with excess of the latter to yield oxygen. The possibility of the aldehyde group being able to exert diastatic action in addition to peroxidising and catalytic action has been examined; it is suggested that the mechanism would consist in the alternate addition (to form a hydrate) and elimination of water. The action of mixtures of starch and formaldehyde was studied by the capillarity method; the presence of dextrins was detected by means of iodine and of sugar by Fehling's solution. The results show that the behaviour of formaldehyde towards starch closely resembles that of diastase. One considerable difference, the recurrence of the blue colour with the lapse of time in the case of mixtures of formaldehyde and starch, appears to be due to the formation of unstable iodine derivatives of formaldehyde or of the achroodextrins, which gradually eliminate iodine. The necessary conditions are the presence of unchanged starch and a substance capable of liberating iodine; if these conditions are fulfilled, elimination of achroodextrins will restore the blue colour to the solution.—H. W.

PATENT.

Culture media. Ger. Pat. 307,831. See XX.

XIXA.—FOODS.

Milk; Determination of lactose in — after the milk has been heated with addition of sodium bicarbonate. C. Porcher and A. Bonis. Ann. Falsif., 1918, 11, 295—299.

When milk is heated with the addition of sodium bicarbonate, the lactose undergoes decomposition. At 80°—90° C. the change is but slight, but at 120° C. it is very marked. The change appears to be due to the conversion of part of the lactose into a lævo-rotatory sugar, since the polarisation falls whilst the reducing power is only slightly reduced. For instance, a milk containing 4.61% of lactose was treated with 2 grms. of sodium bicarbonate per litre and pasteurised at 80°—90° C.; it then showed 4.43% of lactose by reduction and 4.36% by the polarimeter. On heating this alkalis milk at 120° C. for 1 hr., the lactose found by reduction was 4.07% and by the polarimeter 2.16%.—W. P. S.

Fruit juices; Use of hydrofluoric acid for preserving — A. Beythien and P. Pannwitz. Z. Unters. Nahr. Genussm., 1918, 36, 116—119.

Hydrofluoric acid and soluble fluorides have distinctly poisonous properties, and the use of the acid as a preservative for fruit juices is dangerous to health. The added hydrofluoric acid cannot be removed completely by the addition of calcium carbonate in quantity slightly larger than that required by theory, and if more than this quantity of calcium carbonate is added, the quality of the fruit juice is affected.—W. P. S.

Baking powder; Determination of carbon dioxide and carbonate in — G. Rupp and E. Wohllich. Z. Unters. Nahr. Genussm., 1918, 36, 101—110.

To ascertain the available carbon dioxide and excess sodium bicarbonate in a baking powder, determinations are made of the total carbon dioxide and the amount remaining after a portion of the sample has been boiled with water for 30 mins.; the difference between the two determinations gives the available carbon dioxide. In the case of baking powders containing calcium carbonate in addition to sodium bicarbonate, the mixture, after boiling, must be filtered and the carbon dioxide determined both in the insoluble portion and in the filtrate. All the determinations are made in a Kelsier-Erdmann carbon dioxide apparatus.—W. P. S.

PATENTS.

Foodstuffs for human beings, cattle and other animals or birds, and manufacture thereof. E. Makin, Manchester. Eng. Pat. 120,166, 22.3.18. (Appl. 5060/18.)

HEATHER, grasses, and other plants are added to distillery meal or other meal, spent hops, and a seasoning liquid or essence. The plants form 30% of the mixture, and the hops 15%. The mass is pulped, cooked by superheated steam, hot air, or direct heat, and reduced to powder or cake form.—J. H. J.

Cocoa and the waste products of chocolate manufacture; Processes for treating — E. de Grousseau and A. Vicougue, Cllichy, France. Eng. Pat. 120,178, 4.6.18. (Appl. 9224/18.) Int. Conv., 10.4.18.

THEOBROMINE, caffeine, and fat are extracted from cocoa or the waste products from the manufacture of chocolate by the use of a special solvent consisting of ethane tetrachloride, 750—900 parts, phenol, 100—250 parts, concentrated ammonia, 15—25 parts,

and water 75–85 parts. The material to be treated is macerated with the solvent in a jacketed vessel at 66°–70° C. and then extracted by continuous circulation for an hour. The solvent is run off and the material is washed with ethane tetrachloride. The solvent and washings are distilled *in vacuo*, the ammonia, ethane tetrachloride, and most of the phenol being collected separately. The residue is transferred to another vacuum still provided with means for the introduction of steam, in which the remainder of the phenol is distilled off. A solvent of fat, such as petroleum ether, is admitted, and allowed to dissolve the fat, after which the solvent is decanted off. The residue is treated with alkali which dissolves the theobromine and tannin, and the caffeine is obtained by filtration. Carbon dioxide is passed into the alkaline solution to precipitate the theobromine, which is filtered off and dried.

—J. H. J.

Beverage; Food — and process of producing same. J. L. Kellogg and B. Kazmann, Battle Creek, Mich., U.S.A. Eng. Pats. (A) 120,121 and (B) 120,279, 15.11.17. (Appls. 16,828 and 16,830/17.)

(A) Starchy material, such as wheat, rye, etc., free from sugar and malt, is ground and made into a dough, which is submitted to steam at 15 lb. pressure for 2½ hours, to dextrinise the starch. The mass is then dried, powdered, roasted, and extracted with water in a percolator. The extract is evaporated and dried *in vacuo*, and then ground to a powder or into scales. The product is readily soluble in boiling water and forms a substitute for coffee. (B) The process is the same as the preceding, but with the addition of crushed malt or extract of malt to the starchy material. The high temperature of the dextrinisation process stops the action of the enzyme before maltose is produced.—J. H. J.

Desiccating apparatus. J. C. MacLachlan, Chicago, Ill., U.S. Pat. 1,259,860, 19.3.18. Appl., 7.1.15.

THE apparatus is intended for drying food products, such as milk, eggs, etc., and especially for carrying out the process described in U.S. Pat. 850,306. The liquid to be desiccated is sprayed by an atomiser into the upper part of a receptacle, into which heated air is also introduced. The liquid is thus immediately dehydrated, and the atomised solids fall into hopper-shaped containers in the lower, enlarged part of the receptacle. The vertical side walls of these containers are in the form of screens covered with canvas or the like, which retains the fine solids but allows air to pass. Below the containers is an exhaust pipe to remove the air. The deposited solids are removed from the containers by worm conveyors, and beaters are provided to clear the canvas or the like when this becomes clogged.

Calcium-casein compound; Process for separation of — from milk. P. Hoering, Berlin. Ger. Pat. 305,953, 4.9.15.

THE compound is precipitated by means of methyl alcohol instead of with the ethyl alcohol usually employed. The product precipitated with ethyl alcohol quickly loses its solubility when left in contact with the mother liquor or on treatment with stronger alcohol, but this change is prevented or very greatly retarded by use of methyl alcohol.

Fodder or fertiliser; Preparation of a — from raw beet-juice. H. Claassen, Dormagen. Ger. Pat. 307,575, 22.6.15.

THE juice is treated at the ordinary temperature with just sufficient lime to precipitate the non-sugar compounds, the precipitate is filtered off, freed from juice, and dried. It contains no free lime or calcium

carbonate. It has a high food value by reason of the albumin and pectin bodies and organic acids it contains and the calcium phosphate also present is a bone-forming substance. It may be used as a supplement to foods poor in albumin and phosphates.

—W. G.

XIXB.—WATER PURIFICATION; SANITATION.

Effluents; Purification of trade — to make them fit for re-use. H. M. Wilson. J. Textile Inst., 1918, 9, 103–105.

INSTANCES are given of processes in which the re-use of trade effluents is in operation. At collieries where coal is washed, the wash-water is treated to recover the fine coal, the water being afterwards used anew. At paper works, the water from the paper machines is treated for the recovery of the pulp which is returned to the machines, whilst the water is re-used. In wool-scouring, fresh water is used for the final rinsing and is passed to the second washer and then to the first washer, after which it is treated for recovery of grease. In piece-scouring, the water used for the first scour is treated for grease recovery; the water from the second and third scour is fit to be used in the first scour. In dyeing, the dirty waters from the vats are discharged into one set of drains, while the cooling and rinsing waters are kept separate and re-used. The first washings which contain considerable amounts of dye are received in a vat, through which fresh goods are passed in order to exhaust the colour from the washings as much as possible; the water is then used to make up the fresh dye solution.

—J. H. J.

PATENTS.

Water; Filtration of —. F. P. Candy, Cheam, Surrey. Eng. Pat. 120,595, 11.10.17. (Appl. 14,691/17.)

A RAPID mechanical filter is provided with a filter bed about 6 ft. in diam., which contains about half-way down suitable means for collecting and discharging the filtered water. The water to be filtered is supplied to both the top and bottom of the bed, the upper part of which thus filters downwards and the lower part upwards, the working pressure on the surface of the upper bed being greater than that on the surface of the lower bed. Means are also provided for washing the filter bed by forcing water under pressure through it from below.—C. A. M.

Liquids, particularly water; Process for removing gases from —. A. Holle, Düsseldorf. Ger. Pat. 308,288, 21.7.16.

THE liquid is passed at a moderate temperature (about 40° C.) over a series of "corrosion" plates, i.e. plates of soft wrought iron or zinc. The apparatus consists of a large container in which the plates are situated in a slightly inclined position, spaced parallel to each other and attached alternately to the top and the bottom of the container, so that the liquid is forced to take a zig-zag path between them. Gas-collecting chambers are formed along the top of the container between alternate pairs of plates, and these chambers communicate with a "header" pipe connecting the gas chambers with an ejector operated by steam from a heating coil inside the container. Alternatively the container may be directly connected with a condenser, a pipe being built into the lower portion of the condenser with a cut-off valve

reaching below the level of the water, so that only the gas-collecting chambers are connected through pipe branches with the vacuum of the condenser.

—J. F. B.

Disinfectant. A. A. Wells; Montclair, N.J. U.S. Pat. 1,280,602, 1.10.18. Appl. 12.11.17.

A DISINFECTANT is made from chlorobenzol, 1400 c.c., phenol crystals, 320 grms., and carbon tetrachloride, 200 c.c., incorporated with a small amount of paraffin wax sufficient to retard evaporation.

—J. H. J.

Insecticide. Eng. Pat. 120,288. See XVI.

Culture media. Ger. Pat. 307,831. See XX.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Morphine; Determination of — in complex substances. I. Revision of the analytical reactions employed. A. Thngle. Amer. J. Pharm., 1918, 90, 689—706.

THE author has investigated the acidimetric and iodometric methods and the iodo-acidimetric method for the estimation of morphine, and the action of various substances on the precipitation of the alkaloid. Morphine is extracted completely by a mixture of chloroform, 2, and alcohol, 1 vol. Alcohol should not be present in the solution when it is desired to precipitate the morphine by means of ammonia or by the addition of ammonium chloride to the alkaline solution. Morphine is not dissolved completely by barium hydroxide solution in the presence of lead acetate. Sulphuric and acetic acids act sufficiently rapidly on morphine to vitiate analytical processes in which they are used, but hydrochloric and salicylic acids do not.—W. P. S.

Oleander leaves; Amount of substances having a digitalis-like action in — and the manner of their natural occurrence. W. Straub. Arch. Exp. Pathol. u. Pharmacol., 1918, 82, 327. (Chem. Zeit., 1918, 42, Rep., 186.

OLEANDER leaves contain about two and a half times as much active principles as digitalis leaves. The active substances are entirely soluble in water, also the crystalline glucosides which, in the pure form, are only very difficultly soluble. Aqueous and alcoholic extracts are quite stable. The absorption of an extract containing the total glucosides is as good as that of the crystallised oleandrin, which is nearly equal to gitalin in this respect. In addition to the active glucosides oleander leaves, like digitalis leaves, contain a considerable amount of a glucoside which gives a green colour reaction with iron salts; this is probably a phenol-glucoside, but in any case not a true tannin body. This substance, probably in proportion to its amount, determines the proportion of the difficultly soluble active glucosides obtained from the plant by aqueous extraction in the presence of the easily soluble glucosides.—W. G.

Proteinogenous amines. I. Synthesis of β -imin-azolyethylamine (histamine). K. K. Kressler and M. T. Hanke. J. Amer. Chem. Soc., 1918, 40, 1716—1726.

THE method followed is based on that of Pyman (this J., 1911, 646, 923) but several additions and improvements are recorded, among which are the

use of sodium thiocyanate instead of the potassium salt in the preparation of 2-thiol-(4 or 5)-amino-methylglyoxaline, the use of the hydrochloride of the latter instead of the free base for conversion into (4 or 5)-hydroxymethylglyoxaline picrate, and the use of boiling benzene instead of ether as solvent in converting the picrate into hydrochloride. In the final reduction of cyanomethylglyoxaline to histamine, the procedure adopted differed considerably from that described by Pyman, and a yield of 165 grms. of histamine dichloride was obtained from 4530 grms. of citric acid.—H. W.

Neosalvarsan; Adulteration of —. L. P. J. Palet. Ann. Falsif., 1918, 11, 290—300.

A SAMPLE examined by the author was quite free from arsenic and consisted mainly of sodium sulphate coloured with picric acid; other samples consisted of sodium sulphate and chloride or starch coloured with picric acid.—W. P. S.

Aromatic compounds [phloroglucinol]; New method of synthesising — from aliphatic compounds. T. Kominos. Comptes rend., 1918, 167, 781—783.

MALONYL chloride and acetone readily react in the presence of marble chips to give phloroglucinol and a compound, $\text{CH}_3\text{CO}\cdot\text{CH}_2\cdot\text{CO}\cdot\text{CH}_2\cdot\text{COCl}$, which when boiled with water and more marble is in its turn converted into phloroglucinol.—W. G.

Essential oil of Amorpha fruticosa. Y. Shinosaki and K. Hoshino. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 774—781.

THE fruit of *Amorpha fruticosa* (Manchuria) contains about 1.1% of an essential oil. The oil is yellow, has an odour recalling that of *Piper nigrum*, and is optically inactive. A sample had sp. gr. 0.9125 at 15° C., $n_D^{20}=1.5032$; acid value, nil; and saponif. value after acetylation 40.51; soluble in 10 vols. of 90% alcohol. When distilled under reduced pressure (4 mm.) it gave the following fractions: From 95° to 110° C., 0.5; 110°—115° C., 7.8; 115°—120° C., 47.9; 120°—125° C., 22.6; and 125°—138° C., 5.7%. The third and fourth fractions consisted chiefly of cadinene and another sesquiterpene, whilst the last fraction contained a considerable quantity of a sesquiterpene alcohol (m.pt. about 118° C.). The oil also contained a small amount of an aldehyde or ketone forming a crystalline bisulphite compound.—C. A. M.

Dissolving zinc chloride. Peacock. See VII.

Pinus thunbergii oil. Shinosaki. See XIII.

PATENTS.

[Hydr]oxy-alkyl ethers of p-acetoaminophenol or substitution products thereof; Manufacture of —. J. Tcherniac, London. Eng. Pat. 120,081, 23.10.17. (Appl. 15,395/17.)

HYDROXYALKYL ethers of p-acetoaminophenol are prepared by causing an alkylene or hydroxy-alkylene monohalogen hydrin to react in an aqueous medium with p-acetoaminophenol or a substitution product thereof, in presence of a substance capable of fixing the free hydrogen halide which is formed. Example: 151 parts of the acetoaminophenol is dissolved, with cooling, in an exactly equivalent quantity of 2N-caustic soda solution, 81 parts of ethylene chlorohydrin is added, and the mixture is heated at 60°—70° C. for 8 hours; the β -hydroxyethyl ether of p-acetoaminophenol separates as an oil which crystallises on cooling.—J. F. B.

Ethyl alcohol from acetaldehyde; Manufacture of —. A. G. Bloxam, London. From Elektrizitätswerk Lenza, Gampel, Switzerland. Eng. Pat. 120,163, 16.3.18. (Appl. 4684/18.)

In the manufacture of ethyl alcohol from acetaldehyde by the action of hydrogen in presence of a catalyst, the use of a relatively small excess of hydrogen gives a product of objectionable odour and rich in aldehyde. This difficulty is avoided by the use of a very large excess of hydrogen, preferably by a system of circulation, the alcohol being condensed by cooling the vapours and the excess of hydrogen returned to the reaction vessel. By the circulation of 30 times the theoretical quantity of hydrogen, the quantity of gas is sufficient to absorb and conduct away the heat of the reaction, and the temperature of the reaction chamber is maintained within the most favourable limits, viz. between 100° and 180° C.—J. F. B.

Analgesic body [anilides of α -bromodiethylacetic acid] and process of making. I. Thorp, Cincinnati, Ohio. U.S. Pat. 1,279,942, 24.9.18. Appl. 21.3.18.

ANILIDE derivatives of α -bromodiethylacetic acid are prepared by treating an arylamine, such as *p*-phenetidine, with an acyl halide of α -bromodiethylacetic acid. These anilides possess analgesic and sedative properties and are colourless, crystalline compounds, slightly soluble in water, and having a somewhat bitter taste. The *p*-phenetidine melts at 54° C.—J. F. B.

Bromolecithalbumin and bromolecithin; Preparation of —. P. Bergell, Berlin-Wilmersdorf. Ger. Pat. 307,490, 5.3.14.

LECITHALBUMIN is brominated in an anhydrous, inert organic solvent by the addition of bromine. The resulting bromolecithalbumin can be converted into bromolecithin by the usual methods for the conversion of lecithalbumin into lecithin. The resulting bromolecithin is much purer than the bromolecithins prepared up to the present from lecithin itself, which is liable to decomposition by oxidation.—W. G.

Bacteriological culture media and liquids; Preparation of —. O. Kammann, Hamburg. Ger. Pat. 307,831, 9.4.16.

PEPTONE prepared from yeast and dried is used. This peptone is obtained as a yellowish-white powder, easily soluble in water. The method is of importance for bacteriological-diagnostic purposes and for the preparation of vaccines.—W. G.

Cystin and its derivatives; Preparation of water-soluble compounds of —. B. Stuber, Freiburg. Ger. Pat. 307,858, 12.12.16.

WHEN insoluble or sparingly soluble compounds of cystin and its derivatives with mercury, mercuric chloride, and silver are dissolved in solutions of sodium chloride, sodium bromide, sodium thiocyanate, or lithium chloride, and to the solution acetone, ethyl or methyl alcohol, or ether is added in excess, a precipitate is obtained, which is filtered off and dried in a vacuum. The derivatives thus prepared are soluble and possess disinfecting properties and can be used for injections or taken internally to combat typhus or other infectious diseases which have their seat in the liver.—W. G.

Mercury-amino-compounds and complex salts of the same; Preparation of —. Schweiz. Serum- und Impfstitut, Berne, Switzerland. Ger. Pat. 307,893, 13.7.16.

By the action of one or more molecules of a mercury salt on 1-phenyl-2,3-dimethyl-4-sulph-

amino-5-pyrazolone, only the nitrogen reacts with the mercury salt, the sulphy-group remaining intact. The new compounds possess strong bactericidal and spirillocidal properties and should find use in therapy.—W. G.

Tannic acid derivatives; Preparation of compounds of — with lime. Knoll und Co., Ludwigshafen. Ger. Pat. 308,047, 6.2.15.

By treating acylated tannic acids, such as acetyl-tannins and formylacetyl-tannins, or other tannic acid derivatives such as formaldehyde-tannic acid, hexamethylenetetraminetannin, and tannin-thymol-methane, with calcium compounds, grey to brown powders, insoluble in water and alcohol, are obtained, valuable for the treatment of dysentery.—D. F. T.

Opium; Production of solutions of the total alkaloids of —. A. Stephan, Wiesbaden. Ger. Pat. 308,151, 27.6.15.

AN aqueous solution of glycerophosphoric acid is used instead of hydrochloric acid for the extraction of the total alkaloids from opium: on account of the nature of the acid it can be used in considerable excess and the deleterious influence of the alkali of the glass thereby avoided.—D. F. T.

Guaiacol; Method for the production of —. E. H. Zollinger, Zürich, Switzerland, and H. Roehling, Milwaukee, Wis. U.S. Pat. 1,281,662, 15.10.18. Appl., 6.1.17.

SEE Ger. Pat. 305,281 of 1916; this J., 1918, 487 A.

Treating cocoa, etc. Eng. Pat. 120,178. See XIXA.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Methyl-Violet as a red sensitiser of the photographic plate. U. Yoshida. Mem. Coll. Sci., Kyoto Imp. Univ., 1918, 3, 69—71.

PHOTOGRAPHIC plates were sensitised by bathing for 5 mins. in a 1:20,000 solution of Methyl Violet in 50% alcohol, with the addition of 5% of ammonia, the bath being cooled by melting ice. The maximum of the conferred sensitiveness was at 640 μ , but no better result was obtained than is given by the Wratten panchromatic plate. Bathing an orthochromatic plate in this solution gave a plate sensitive to almost all colours down to about 660 μ , with a definite minimum in the green at 530 μ .—B. V. S.

Light-sensitive films; Law of blackening of —. F. Halla and A. Schuller. Z. physik. Chem., 1918, 93, 173—182.

MATHEMATICAL relationships between the time of exposure to light and depth of darkening of a light-sensitive film are deduced. These relationships are also extended to the case where the film lies on a reflecting base. The peculiarities observed in the darkening curves cannot be explained by the scattering of light.—J. F. S.

Diffusion into gelatin. Von Fürth and Bubanovič. See XV.

Balsam problem. French. See XXIII.

PATENT.

Colour photography. Hess-Ives Corporation, Assignees of F. E. Ives, Philadelphia, Pa., U.S.A. Eng. Pat. 112,769, 12.11.17. (Appl. 16,572/17.) Int. Conv., 15.1.17.

SEE U.S. Pat. 1,268,847 of 1918; this J., 1918, 607 A.

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Nitrated cellulose; Apparatus for drowning, washing, and conveying — J. D. Flack, New York. U.S. Pat. 1,280,981, 8.10.18. Appl., 9.2.16.

AN elongated shallow trough containing wash water is provided with a stationary false bottom, the ends of which are spaced from the ends of the trough. A screen, forming a continuation of the false bottom, is fitted at the discharge end. The nitrated cellulose is fed into the water above the false bottom at the inlet end, and is immersed, washed, and worked along by a paddle to the discharge end, where it is retained by the screen. The water passes through the screen and returns to the inlet end below the false bottom.—T. St.

XXIII.—ANALYSIS.

Balsam problem [in optical instruments]. J. W. French. Trans. Opt. Soc., 1918, 19, 143—163.

THE cementing together of the various parts of an optical system by means of Canada balsam is the commonest method of assembling the parts and has advantages over the other three methods described, namely mechanical fixing with air spaces between contiguous faces, optical contact between faces with or without a seal of cement round the edge, and the Parker and Halliday method of heating with surfaces in optical contact up to welding point. The method, however, is not without objection owing to the possibility of "starring" of the balsam and separation of the parts in course of time or as a result of shock, and of distortion of the surfaces sufficient to cause defects of definition. Mastic, colophony, copal, balsam of Tolu, and fish glue have also been used as cements; the advantage of one cement as compared with another lies rather in its physical properties, such as working temperature, hardness of setting, brittleness when set, and contraction with setting than in the exact refractive index or degree of dispersion. The contraction of the cement on drying or setting, which if excessive produces "starring" or distortion or both, is very small with Canada balsam, slightly less with colophony, while with "zapon" (celluloid in amyl acetate and acetone) it is several hundredfold greater. The examination of a number of old cemented optical parts showed that the hardening of the balsam extends only 1 to 4 mm. from the edge, the centre being almost uniformly soft; where melted balsam had been used for cementing, the outer ring was found to be very brittle and not directly adherent to the glass itself but separated from it by a thin oily film. A number of illustrations of various defects, "starring," and separation are given, chiefly defects produced by long-continued baking of the balsam. In the subsequent discussion the addition of castor oil or cedar-wood oil, up to about 4%, to reduce the brittleness of the dried balsam and consequent tendency to "starring," was advocated.—B. V. S.

Thermo-couples. Ber. Physik.-Techn. Reichsanstalt, 1917. Stahl u. Eisen, 1918, 38, 1044.

FROM tests with various base-metal thermo-couples the following conclusions are drawn: Thermo-couples with one element of iron (constantan-iron, nickel-iron) should not be used above 800° C. Couples having a free thin nickel wire should not be used for long periods at temperatures above 1100° C. in contact with air, and will in future only be tested up to this temperature by the Reichsanstalt. Couples formed by 3 mm. wires of nickel and nickel-chromium respectively may, however, be used up to 1200° C. Nickel-carbon couples consisting of nickel wire passing through a concentric carbon tube and thus protected against oxidation may be used for a considerable time at 1200° C., and for short periods at 1250° C.

Dialysers made from colloidal membranes. L. Berczeller. Biochem. Zeits., 1918, 90, 302—304.

THE author discusses the adsorption of iodine by colloidal membranes and the alterations of the permeability of the membranes according to whether they are treated with water when the organic solvent is still in them or when they are nearly free therefrom. (See also J. Chem. Soc., Jan., 1919.)—S. B. S.

Potassium bichromate; Oxidising action of — as compared with that of pure iodine. C. R. McCrosky. J. Amer. Chem. Soc., 1918, 40, 1662—1674.

IT is shown that in iodometric determinations potassium bichromate always liberates more iodine than the theoretical quantity from hydriodic acid. This excess of iodine may be reduced but not entirely removed by expelling dissolved air from the solutions, by drying and fusing the bichromate in the absence of air, and by recrystallising it repeatedly to remove oxidising impurities. It is also shown that the excess iodine is in no way due to the catalytic action of chromium chloride.

—J. F. S.

Calcium; Gravimetric determination of — and the separation of calcium from magnesium. L. W. Winkler. Z. angew. Chem., 1918, 31, 187—188, 203, 214—216.

CALCIUM is best precipitated as oxalate by acidifying the neutral solution with acetic acid, adding an excess of ammonium chloride, and treating the boiling solution with ammonium oxalate. After 24 hours, the precipitate is collected, washed, dried at 100° C., and weighed. It may be ignited to oxide before being weighed, but this is not recommended, especially if the solution contained sulphate. In such case, the calcium oxalate always contains calcium sulphate, but this contamination does not affect the weight of the calcium oxalate as the two salts have about the same molecular weight. Potassium salts and chromates do not interfere with the determination, but the results are too high when sodium salts are present. Calcium may also be precipitated as carbonate, provided that ammonium salts and chromates are not present in the solution. To separate calcium from magnesium, 100 c.c. of the solution, containing not more than 0.1 gm. of calcium or 0.05 gm. of magnesium, is treated with 3 grms. of ammonium chloride and 10 c.c. of N/1 acetic acid, boiled, and 20 c.c. of 2.5% ammonium oxalate solution is added. After 18 hrs., the calcium oxalate is collected and weighed, and the magnesium in the filtrate is precipitated as ammonium magnesium phosphate and weighed as such.—W. P. S.

Lipoids; Micro-estimation of — by titration. I. Bang. *Biochem. Zeits.*, 1918, **91**, 86—103.

THE fats are oxidised by potassium chromate solution at ordinary temperature in presence of excess of sulphuric acid. Excess of the chromate is then estimated by the addition of potassium iodide and titration of the liberated iodine by thio-sulphate solution. The fat (from blood, etc.) is separated by extraction with benzene, a little alkali is added (to emulsify the fat) and then the solvent is distilled off. Cholesterol can be estimated in the same manner, and the same factor can be employed in making the calculations; this factor is determined empirically, as under the conditions of experiment employed the oxidation is not complete. When cholesterol is present with fats, the determination of both constituents can be made by precipitation of the cholesterol by digitonin which is insoluble in benzene. Methods are also given for the estimation of the cholesterol esters in the presence of fats, and a preliminary account is given of the methods of estimating the lipoids. (See also *J. Chem. Soc.*, Jan., 1919.)—S. B. S.

Petroleum oils. Tausz. *See* IIa.

Lubricating oils. Dubrisay. *See* IIa.

Sodium peroxide. Milbauer. *See* VII.

Silica bricks. Montgomery and Office. *See* VIII.

Plasticity of clays. Kirkpatrick and Orange. *See* IX.

Superphosphates. Aita. *See* XVI.

Baking powder. Rupp and Wohnlich. *See* XIXa.

Determination of morphine. Tingle. *See* XX.

PATENTS.

Hydrometers. P. Stevenson, Edinburgh. Eng. Pat. 120,659, 15.12.17. (Appl. 18,686/17.)

A HYDROMETER of the type comprising a closed bulb containing ballast, connected to a graduated stem, is provided with a tube of smaller diameter than the stem extending down through it and through the bulb. This tube is open at the top and bottom, and is sealed into the bottom of the bulb so as to be open to the liquid which thus rises in the tube to the level of the external liquid. The sensitivity of the instrument is thereby increased without decreasing the diameter of the stem and the legibility of the graduations.—W. F. F.

Combustible gases or vapour in the atmosphere; Appliance for giving a warning of the presence of —. A. and L. D. Williams, and The Thames Trading Co., Ltd., London. Eng. Pat. 120,661, 28.12.17. (Appl. 19,168/17.)

AN electrically conducting rod of fusible metal, such as tin, is surrounded by a solid cylinder of non-conducting material impregnated or coated with finely-divided platinum. An electric heating coil is wound on the cylinder to warm it and maintain the platinum in active condition so that surface combustion of the combustible gases in the surrounding atmosphere takes place. If the temperature becomes sufficiently high due to excess of combustible gas, the central rod fuses, and the breaking of the circuit operates an alarm. The fusible rod may be maintained in tension by a spring at each end, the springs being connected

in series with the heating coil, a battery, and the electromagnet of an electric bell. When the circuit is broken by the fusion of the rod, the magnet is de-energised, and the hammer falls back and completes a shunt circuit forming the normal circuit of the bell, which thus continues to ring. In a modification, the breaking of the fusible rod releases a cam which is rotated by a clock spring and operates a bell mechanically. In another modification the impregnated cylinder or disc is dispensed with and the fusible rod is placed transversely across a vertical tube through which the air passes upwards. An independent electric heating coil is placed in the tube below the fusible rod and causes combustion of the gas. When the temperature is sufficiently high, the rod is fused and an alarm is operated. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 3644 of 1882, 6364 of 1911, 15,094 of 1915, and 110,439; this *J.* 1916, 1273; 1917, 1248.)—W. F. F.

Gas analysis by absorption with solid substances; Apparatus for —. H. Strache, Vienna, and K. Kling, Lemberg. Ger. Pat. 308,065, 8.11.16.

THE apparatus consists essentially of a small cylindrical pump, in which there is a definite volume enclosed between the two extreme positions of the piston. The two ends of the cylinder are connected by tubes with a nine-way tap by means of which the cylinder may be connected as required with the gas inlet, the absorption chamber, the outer air, and a manometer. The absorption vessel is a large tubulated jar.—W. G.

Viscosimeter. R. F. MacMichael, Auburn, Wash. U.S. Pat. 1,251,042, 8.10.18. Appl., 5.10.14.

A VESSEL containing the liquid to be tested is supported on a platform which carries a footstep bearing and is continuously rotated. A horizontal disc is suspended in the liquid by a torsion wire, the upper end of which is looped and supported by a pair of grooved pins carried by a vertical standard. The torsion wire is enclosed in a vertical tube which is attached to the disc at the bottom and to an indicating dial at the top. The viscosity is measured by the angular rotation of the disc as indicated by the dial. The support for the vessel contains an electrical heating coil to vary and control the temperature of the liquid. (See also this *J.*, 1915, 1226.)—W. F. F.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

- Acton. Apparatus for separating solid particles from liquids. 21,756. Dec. 30.
- Alexander (United Filters Corp.). Continuous vacuum filters. 21,759. Dec. 30.
- Boland. Drying process. 21,927. Dec. 31.
- Fenton and Vivian. Rotary kilns, and means for heating same. 21,470. Dec. 21.
- Francart. Method of operating furnaces, kilns, ovens, etc. 21,322. Dec. 19.
- Francart. Tunnel furnaces, kilns, ovens, etc. 21,323—21,325. Dec. 19.
- Francart. 21,327. *See* VIII.
- Furness. Filter plate for filtering acids etc. 20,917. Dec. 16.

Graham and Honeywood. Crushing or grinding machinery. 21,279. Dec. 19.
 Hardinge. Grinding mills. 21,553. Dec. 23.
 Hughes. Carrying out certain chemical reactions and physical actions. 21,452. Dec. 21.
 Jennings. Grinding machines. 21,102. Dec. 17.
 Johansson. Separators. 21,062. Dec. 17.
 Kilburn (Sulzer Frères). Condensing or evaporating apparatus. 21,204. Dec. 19.
 Mason. Filter press plates. 21,231. Dec. 19.
 Rivett. Grinding machines. 21,076. Dec. 17.
 Shaw. Apparatus for evaporating or concentrating liquids. 21,286. Dec. 19.
 Thatcher. Diaphragms, etc., for separating two liquids. 21,799. Dec. 30.
 Wade (Lindbergh). 21,462. *See* VII.
 Webster. Filter presses. 21,057. Dec. 17.

COMPLETE SPECIFICATIONS ACCEPTED.

8926 (1917). Bradley. *See* XI.
 18,870 (1917). Menzies. Apparatus for use in treating liquids with gases. (121,521.) Dec. 31.
 19,209 (1917). Laurie. Drying solid substances precipitated from solutions in water or other liquids. (121,372.) Dec. 30.
 2178 (1918). Maxwell. Dehydrating vegetable, textile, and other substances. (121,394.) Dec. 30.
 6357 (1918). Adt Co. Drying apparatus. (117,603.) Dec. 30.

14,943, 14,944, and 14,947 (1918). Bradley. *See* XI.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

Abrahams and Bamber. Generation of producer gas. 21,539. Dec. 23.
 Ballinghall and Dempster. 20,941. *See* VII.
 Christopher. Distilling, carbonising, or gasifying coal, carbonaceous material, oil shales, etc. 21,724. Dec. 30.
 Colman and Yeoman. Extraction and recovery of carbon bisulphide. 21,389. Dec. 20.
 Crush. Gas-producing plant. 21,021. Dec. 17.
 Davidson. Preparation of damp peat for manufacture of producer gas. 21,502. Dec. 23.
 Davies. Carbonising fuel by vertical coke ovens etc. 21,239. Dec. 19.
 Eastick and Eastick. 20,971. *See* XVII.
 Francart. 21,327. *See* VIII.
 Gonville. Fuel. 21,378. Dec. 20.
 Hewitt Construction Synd., and Whitcher. Appliances for steaming gas retorts. 21,637. Dec. 24.
 Ionides. Gaseous combustion. 21,314. Dec. 19.
 Lea. Briquetting peat. 21,540. Dec. 23.
 Remfry. Retorts for distilling shale etc. 21,819. Dec. 30.
 Tinker. Production of petrol. 21,289. Dec. 19.
 Tinker. Fuel oils. 21,588. Dec. 24.
 Topp. Elimination of water from peat etc. 21,881. Dec. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

14,997 (1917). Oil Extractors, Ltd., and Lamp-lough. Coal-distilling apparatus. (121,496.) Dec. 31.
 18,249 (1917). Nelson. Gas-producers. (112,128.) Dec. 30.
 18,653 (1917). Ellis, Foster, and Ellis-Foster Co. Making lighter from heavier petroleum oils. (121,856.) Dec. 30.
 18,815 (1917). Grocott. Furnaces for the generation and combustion of producer gas. (121,516.) Dec. 31.
 19,245 (1917). Twynam. Production of artificial fuel and utilisation of peat (121,373.) Dec. 30.

III.—TAR AND TAR PRODUCTS.

APPLICATION.

Matthews and Strangé. 21,402. *See* XX.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

Ehrhardt and Merriman. Manufacture of after-chroming azo dyestuffs. 21,445. Dec. 21.
 Holliday and Law. Production of colouring matters of anthraquinone series. 21,340 and 21,341. Dec. 20.

COMPLETE SPECIFICATION ACCEPTED.

18,484 (1917). Angel (Angel). Manufacture of compounds to be used as colouring matters or in the manufacture of colouring matters. (121,347.) Dec. 30.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

Charlesworth. Machines for drying hanks of yarn. 21,255. Dec. 19.
 Jamieson. Paper manufacture. 21,748. Dec. 30.
 Pellerin. Manufacture of filaments from hydrated cellulose. 21,081. Dec. 17. (Fr., 20,11,13.)
 Puttaert and Puttaert. Manufacture of pulp and paper from garbage. 20,972. Dec. 16.
 Rawlins. Treatment or preparation of paper etc. 21,421. Dec. 21.
 Skinner. Pulp and fibres for paper-making etc. 21,790. Dec. 30.
 Stockton. Purifying cottonseed hull fibre. 21,906. Dec. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

17,920 (1917). Croll. Manufacture of water-proof paper. (121,318.) Dec. 30.
 2178 (1918). Maxwell. *See* I.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATION.

Lord and Lord. Machines for dyeing, washing, scouring, sizing, bleaching, and mercerising yarn in hank form. 21,864. Dec. 31.

COMPLETE SPECIFICATION ACCEPTED.

1941 (1918). Longthorne, and Leather, Ltd. Textile fibre printing processes. (121,390.) Dec. 30.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Ashcroft. 21,335. *See* X.
 Ballinghall and Dempster. Process relating to reducing operations in hydrogen-making plants. 20,941. Dec. 16.
 Brightmore. Apparatus for fixing atmospheric nitrogen. 21,318. Dec. 19.
 Furness. 20,917. *See* I.
 Grauel. Recovery of potassium from potassium-bearing silicates. 21,808. Dec. 30.
 Norske Aktieselskab for Elektrokemisk Industri. Production of alumina poor in iron. 21,659. Dec. 24. (Norway, 8,418.)
 Soc. Industrielle de Produits Chimiques. Conversion of alkaline monochromates into bichromates. 21,503. Dec. 23. (Fr., 5,118.)
 Wade (Lindbergh). Recovering salts from mother liquors. 21,462. Dec. 21.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

- Adair. Drying china clay. 20,912. Dec. 16.
 Donald. Manufacture of refractory materials such as bricks, blocks, etc., used in construction of furnaces, etc. 21,038. Dec. 17.
 Francart. 21,322—21,326. *See* I.
 Francart. Drying bricks, tiles, pottery, peat, etc. 21,327. Dec. 19.
 Marks (Kohler Co.). Manufacture of enamelled ware. 21,557. Dec. 23.
 Sankey. Manufacture of firebricks, blocks, tiles, retorts, etc. 21,315. Dec. 19.
 Shaw, Shaw, and Shaw. Furnaces for melting glass etc. 21,443. Dec. 21.

IX.—BUILDING MATERIALS.

APPLICATIONS.

- Donald. 21,038. *See* VIII.
 Francart. 21,327. *See* VIII.
 Gronroos. Production of hard flooring or insulating slabs. 21,264. Dec. 19. (Denmark, 19.3.18.)

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

- Annable and Janson. Treatment of ores, etc., containing scheelite. 21,924. Dec. 31.
 Ashcroft. Production of magnesium or magnesium alloys and magnesium chloride or alkali chloride. 21,395. Dec. 20.
 Bloxam (Stabilimenti Bink-Ing. A. Pouchain). Metallurgical furnaces. 21,542. Dec. 23.
 Dresden. Soldering metals. 21,514. Dec. 23.
 Griggs. Open-hearth furnaces. 21,550. Dec. 23.
 Jackson, Lancaster, Rogers, and Walter. Treatment of tinned scrap. 21,520. Dec. 23.
 Janson. Ore-roasting furnaces etc. 21,171. Dec. 18.
 Soc. Anon. de Commentry Fourchambault et Decazeville. Alloys containing iron, nickel, and chromium. 21,068—21,070. Dec. 17. (Fr., 19, 20, and 21.12.17.)
 Stein et Cie. Charging steel-melting etc. furnaces. 21,794. Dec. 30. (Fr., 12.9.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

- 13,131 (1917). Edser, Tucker, and Minerals Separation, Ltd. Concentration of ores. (121,303.) Dec. 30.
 16,512 (1917). Dickson and Nicklen. Manufacture of steel. (121,311.) Dec. 30.
 7650 (1918). Grondal. Mechanical roasting-furnace. (115,639.) Dec. 31.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

- Campbell. Electric furnaces. 21,541. Dec. 23.
 Fenton. Electric furnaces. 21,831. Dec. 30.
 Joel. Electric accumulators. 20,988. Dec. 16.
 Magini. Electric arc furnaces. 21,894. Dec. 31. (Italy, 31.12.17.)
 Waring and Waring. Electric furnaces. 21,863. Dec. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

- 8926 (1917). Bradley. Electrical treatment of gases. (107,880.) Dec. 30.
 16,261 (1917) and 4529 (1918). Leitner. Electric accumulators. (121,309.) Dec. 30.
 3883 (1918). Turner and Walker. Regulating electrodes of electric furnaces. (121,409.) Dec. 30.

- 6563 (1918). Watson and Co., Greaves, and Etchells. Electric furnaces. (121,563.) Dec. 31.
 14,943, 14,944, and 14,947 (1918). Bradley. Electrical treatment of gases. (119,236, 119,237, and 119,238.) Dec. 30.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

- Donnenberg and Jacobson. Soap. 21,603. Dec. 24.
 Engel. Oil-extraction apparatus. 21,410. Dec. 20.
 Lane. Apparatus for hydrogenising oils etc. 21,895. Dec. 31.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

- Damard Lacquer Co. Phenol-formaldehyde condensation products. 21,352. Dec. 20.
 Ivinston and Roberts. Anticorrosive paint or composition. 21,504. Dec. 23.
 Kenton. Writing composition. 21,438. Dec. 21.
 Ponton, Ponton, and Ponton. Manufacturing physical radiant colours. 21,343. Dec. 20.

COMPLETE SPECIFICATIONS ACCEPTED.

- 18,619 (1917). Sperr and Darrin. Manufacture of paint or varnish. (118,079.) Dec. 30.
 988 (1918). British Thomson-Houston Co. (General Electric Co.). Manufacture and application of japan. (121,533.) Dec. 31.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATION.

- Stenhouse. Adhesive compound and process of making same. 21,838. Dec. 30.

COMPLETE SPECIFICATIONS ACCEPTED.

- 18,183 (1917). Cock and Williams. Method of tanning. (121,325.) Dec. 30.
 16,968 (1918). Blanc. Process of tanning and manufacture of tanning liquors. (120,049.) Dec. 30.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

- Eastick and Eastick. Manufacture of decolorising vegetable carbon. 20,971. Dec. 16.
 Martin. Manufacture of lactose or milk sugar. 21,833. Dec. 30.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

- Banks. Treatment of cereals etc. 20,943. Dec. 16.
 Prescott. Preserving food by means of carbon monoxide etc. 21,618. Dec. 24.
 Puttaert. 20,972. *See* V.

COMPLETE SPECIFICATIONS ACCEPTED.

- 18,635 (1917). Oxley. Food product. (121,355.) Dec. 30.
 2178 (1918). Maxwell. *See* I.
 3776 (1918). Goodwin. Treatment of semolina. (121,408.) Dec. 30.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

- Arellano. Medicament. 21,578. Dec. 23.
 Matthews and Strange. Separating derivatives of *o*- and *p*-toluenesulphonic acids and manufacturing saccharin. 21,402. Dec. 20.
 New Oxydol Products, Ltd., and Ramsay. Pharmaceutical preparations. 21,297. Dec. 19.

I.—GENERAL; PLANT; MACHINERY.

Colloid chemistry and its industrial application. F. G. Donnan and others. Rep. Brit. Assoc., 1917, 20–105.

THE first report of a committee appointed to compile information regarding the advances made in capillary and colloid chemistry with special reference to industrial processes. The report includes the following articles:—(1) Viscosity of colloids, 3 pp., E. Hatschek. (2) Colloid chemistry of tanning, 15 pp., H. R. Procter. (3) General review and bibliography of dyeing, 19 pp., P. E. King. (4) Colloid chemistry in the fermentation industries, 3 p., A. J. Brown. (5) Rubber, 5 pp., H. P. Stevens. (6) Colloid chemistry of starch, gums, hemicelluloses, albumin, casein, gluten, and gelatin, 32 pp., H. B. Weeks. (7) Colloids in the setting and hardening of cements, 4 pp., C. H. Desch. (8) Nitrocellulose explosives from the standpoint of colloidal chemistry, 2 pp., E. R. Chrystall. (9) Celluloid from the standpoint of colloidal chemistry, 2 pp., E. R. Chrystall. Very full bibliographies are included.—J. F. S.

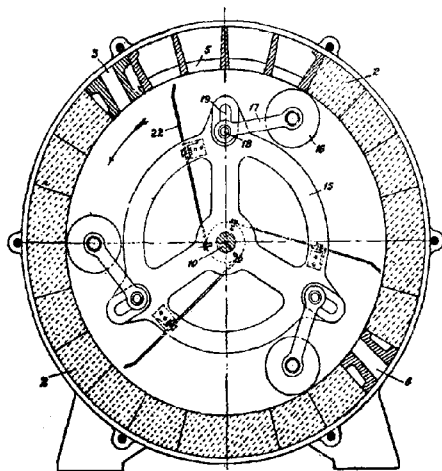
PATENTS.

Grinding mills. A. Schär, Flawil, Switzerland. Eng. Pat. 115,424, 13.4.18. (Appl. 6305/18.) Int. Conv., 3.5.17.

THE material is ground between two vertical plates, one fixed and the other moving up and down in guides so arranged that the two plates are successively divergent upwards, parallel, and then divergent downwards, as the movable plate passes from its highest to its lowest position. The material is thereby received, crushed, and discharged.—W. F. F.

Grinding machines. F. W. Lyon and A. Ross, Liverpool. Eng. Pat. 321,206, 22.12.17. (Appl. 18,999/17.)

MATERIAL to be ground is fed by an opening, 3, into the grinding cylinder, 2, having a rotating cage, 15, provided with radial slots, 19. The grinding rollers, 16, are carried by links, 17, the ends, 18, of which may be pivoted at any point in the



slots, 19. Vanes, 22, inclined backwards to the direction of rotation, are also attached to the cage, 15. The ground material is discharged through a grid, 5, occupying from one quarter to one third of

the circumference of the cylinder, and a reduced pressure is maintained in the discharge conduit above the grid. Air is admitted by the opening, 6, and the width of the grid, 5, in relation to the distance between the vanes, 22, is such that the air passes through to the outlet periodically, so that heavier material may fall back from the discharge conduit into the grinding cylinder. The shaft, 10, is mounted in bearings which are carried by short vertical spindles free to slide vertically. Any accumulation of material in the bottom of the grinding cylinder will thus cause the shaft to lift, and this movement may be used to regulate through suitable mechanism, the supply of material to the machine.—W. F. F.

Crusher and pulveriser. P. S. Knittel, Assignor to American Pulverizer Co., St. Louis, Mo. U.S. Pat. 1,282,239, 22.10.18. Appl., 2.1.18.

THREE radial carrier members are keyed to a horizontal rotating shaft at intervals, and each is provided with a circular aperture near its edge which registers with the apertures in the others, so that a parallel revolving spindle may be carried by them. The portions of the spindle between the carriers are eccentric with respect to the remainder of the spindle, and hollow cylindrical beaters of considerably larger internal diameter are mounted on these eccentric portions. The revolving spindle may be secured in any angular position in its carriers by means of set screws.—W. F. F.

Precipitation; Apparatus for —. D. C. Walker, Anaconda, Mont. U.S. Pat. 1,281,443, 15.10.18. Appl., 14.3.16. Renewed 24.8.18.

A SERIES of cylindrical precipitation tanks having conical bottoms are arranged at successively lower levels so that liquid can overflow from one to the next. A corresponding number of closed conical settling tanks provided with spraying devices are arranged all at the same level below the precipitating tanks. The precipitating tanks are each provided with perforated containers for the precipitant and with a screen below the container. The tanks are connected by a system of pipes and valves so that the liquid may flow from the precipitating tanks to the settling tanks, where the precipitate is deposited and subsequently discharged. The liquid may also be made to flow by hydrostatic pressure from the upper part of one settling tank to the top of the next precipitating tank, or the liquid flowing from the bottom of one precipitating tank may be diverted into the upflow pipe from its own settling tank and so pass direct to the next precipitating tank.

—W. H. C.

Subdivided solid materials; Apparatus for subjecting — to the action of a current of gases. E. B. Kirby, St. Louis, Mo. U.S. Pat. 1,281,585, 15.10.18. Appl., 21.7.14.

THE receptacle containing the material is provided with a number of perforated hollow vertical partitions. Alternate partitions are connected to the supply and discharge pipes for the gas, so that the gas flows from one partition to the next through a uniform thickness of material. Means are provided for charging the solid material at the top and discharging the finished product at the bottom without tilting the receptacle. The perforations in the partitions are at such a depth in the material that gas is prevented from escaping upwards, and the wall of the receptacle adjacent to the charging opening is inclined so as to prevent the material from being lifted out by gas pressure below.

—W. F. F.

Emulsions; Process and apparatus for dehydrating — F. W. Harris, Los Angeles, Cal. U.S. Pat. 1,281,952, 15.10.18. Appl., 4.4.17.

A PAIR of electrodes are immersed in the emulsion and brought sufficiently close to one another to cause "water chains" to be formed between them, and allow heavy short-circuit currents to flow. The electrodes are then separated to interrupt the short-circuit currents.—W. F. F.

Filter-press plate. J. E. Hagstrom, Brooklyn, N.Y., Assignor to The Independent Filter Press Co., Inc., New York. U.S. Pat. 1,282,144, 22.10.18. Appl., 26.1.18.

A FILTER-PRESS plate comprises a rigid frame carrying a grooved "field" which is movable within the frame.—T. St.

Filtering apparatus. A. R. Peck, Los Angeles, Cal. U.S. Pat. 1,282,280, 22.10.18. Appl., 28.8.16.

A FILTER-LEAF is formed with a flattened tubular rim having a slot into which the marginal portion of a wire screen fits. The tubular rim is provided with spacing lugs, with upper and lower outlets, and with a pet-cock.—W. H. C.

Pump for acids. H. Tobler, Hackensack, N.J. U.S. Pat. 1,282,145, 22.10.18. Appl., 23.4.18.

Two cylinders having similarly arranged inlets and outlets are each provided with an internal flexible tube connecting the inlet and outlet. The inlets are connected with a pipe supplying the liquid to be pumped and the outlets with a discharge pipe. The cylinders are connected respectively with the opposite ends of a third cylinder provided with a reciprocating piston which alternately forces water or other suitable liquid into and withdraws it from the cylinders containing the flexible tubes. The flexible tubes are consequently alternately contracted and expanded, and the acid liquid is discharged through the outlet connected with the contracted tube and a fresh quantity drawn in through the inlet connected with the expanded tube.—W. H. C.

Furnace; Regenerative — A. L. Stevens, Chicago, Ill. U.S. Pat. 1,282,649, 22.10.18. Appl., 25.9.16.

THE combustion chamber of a regenerative furnace is provided with fuel-supply pipes connected to sets of burners which are used alternately, and each pipe is connected to a valve chamber having a diaphragm with an opening which may be closed by a revolving damper valve. The valves are operated in succession by Geneva movements which are timed so that a closed valve is opened only after an appreciable time subsequent to the closing of an open valve.—W. F. F.

Liquids and powdered material; Process for mixing — Akt.-Ges. Siegerner Dynamitfabrik, Förde. Ger. Pat. 308,783, 11.3.16.

THE materials to be mixed, in the course of their upward and downward movement through the apparatus, are also moved in a horizontal direction from the circumference to the centre and *vice versa* in order to ensure a thorough mixing. The apparatus consists of a vertical cylindrical container with a conical bottom; a pair of tubes with projecting arms are suspended side by side within the cylinder and rotated in opposite directions through a certain angle. The vertical distance between the arms in the upper part of the vessel is smaller than that between those in the lower portion in order to break up any lumps. Inside

the tubes are worm conveyors, and the shafts of the tubes and the worm conveyors are carried on bearings situated above and outside the vessel. The tubes are driven by eccentrics and the worm-shafts by rope pulleys from the same counter-shaft. Above the uppermost arms, the two tubes are pierced with several outlets, above which the worm shaft carries a screw which forces the material downwards.—J. F. B.

Lead linings for accumulator boxes, cistern boxes, and the like; Method of and apparatus for manufacturing — W. G. and J. W. Claughton, Manchester. Eng. Pat. 121,883, 17.1.18. (Appl. 945/18.)

Drying apparatus. The John B. Adt Co., Assignees of J. B. Adt, Baltimore, Md., U.S.A. Eng. Pat. 117,603, 15.4.18. (Appl. 6357/18.) Int. Conv., 17.7.17.

SEE U.S. Pat. 1,255,843 of 1918; this J., 1918, 197 A.

Dry kiln. H. Hunter, Indianapolis, Ind., U.S.A. Eng. Pat. 120,809, 14.12.17. (Appl. 18,626/17.)

SEE U.S. Pat. 1,254,142 of 1918; this J., 1918, 197 A.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coke breeze; Briquetting of — Kayser. J. Gasbeleucht., 1918, 61, 541—547, 556—558.

COKE breeze requires from 9 to 10% of pitch as binding material for briquetting purposes. In the "Koxit" process, patented by Alexander, part of the pitch is replaced by a cheaper fluid binding material consisting of oil-gas tar and vertical-retort tar in about equal parts. The mixture of coke, pitch, and liquid binding medium is heated with superheated steam and pressed into egg-shaped briquettes. In a series of trials, the moisture content of the coke breeze varied from 9.3% to 19.9%. The softening point of the pitch was 83° C. A satisfactory briquette was obtained by the addition of about 5% pitch and from 0.8 to 1% of the liquid binding material. The air-dried briquettes contained about 3.5—4.5% of water and yielded about 14—16% ash. The calorific value was 6400—6600 cal. The quantity of water taken up when the briquettes were stored under water for 7—8 days ranged from 13 to 18.6%, as compared with 11.9% by brown coal briquettes under similar conditions. The loss of weight after transport by rail, unloading, and storing for 6 months was in three tests with large quantities (3200, 3250, and 7200 kilos.) 4.1, 6.3, and 4.3% respectively. For preference the pitch should have a softening point between 60° C. and 75° C. For steam-raising purposes, an addition of from 20 to 25% of coal dust is in general necessary to secure efficient combustion. The briquettes do not crumble when burnt and this is due to the coking of the fluid binding material during the combustion. This coking effect is increased by the use of liquid binding materials capable of acting as solvents for the pitch, and of such materials, vertical retort and chamber oven tars and oils, such as anthracene oil, are found particularly suitable. Very viscous binding material is not suitable, as by its use air is entrapped in the pores of the coke breeze and the briquette on subsequent combustion crumbles owing to the expansion of the entrapped air. A process has been patented whereby this effect is reduced by adding the liquid binding material under reduced atmospheric pressure. The

total cost of manufacture including establishment charges, cost of material and labour, since the commencement of the war has amounted to M.7-67 per ton. The sale price, determined by the relative calorific values of the respective fuels, is about 14 to 15% lower than that of coke.

—J. S. G. T.

Methane. W. Malisoff and G. Egloff. *J. Phys. Chem.*, 1918, 22, 529–575.

THIS paper contains a summary from all sources of the investigations which have been carried out on methane, under the following headings: physical constants; specific properties; gas properties; industrial application of physical characteristics; combustion and explosion; solubility in various solvents; occlusion; industrial reactions of methane including oxidation, halogenation, carbides from methane, cyanide formation; synthesis and decomposition of methane by chemical, catalytic, and electrical methods; sources and supply of methane. It is pointed out that the consumption of natural gas in America in 1917 reached the figure of 900,000,000,000 cub. ft., this gas averaging 78.2% methane. The great importance of further research on the gas is emphasised and a list of 53 different problems requiring investigation is given.—E. H. R.

Acetylene condensations; Pyrogenic —. V. R. and W. Meyer. *Ber.*, 1918, 51, 1571–1587.

CONTINUING the previous investigation (*Ber.*, 1917, 50, 422) the authors have detected *o*-xylene, mesitylene, *p*-cumene, and indene, but not durenene or isodurenene in the tar obtained by the pyrogenic condensation of acetylene. *a*-Thiotolene has been found in the condensation product of the acetylene-methane-hydrogen sulphide mixture, and thionaphthene in that of the acetylene-hydrogen sulphide mixture. The velocity of the gaseous mixture through the three ovens (at 550° C., 630° C., and 850°–900° C. respectively) is of importance. When the rate is 70–90 litres per hour the hydrocarbons of high boiling-point are formed in larger quantities than at faster rates (about 120 litres per hour), at which the formation of the more easily volatile substances predominates. The formation of aniline from benzene vapour and ammonia at 550°–700° C. has been observed. (See also *J. Chem. Soc.*, Feb., 1919.)—C. S.

Acid tars [from petroleum refining]; Oily constituents of —. S. Gasiorowski and G. von Kozicki. *Bergbau u. Hütte*, 1918, 4, 181–182. *Z. angew. Chem.*, 1918, 31, Ref., 354.

AN oil of sp. gr. 0.9685 at 18° C., setting pt. –19° C., flash point (Martens-Pensky) 86° C., and viscosity (Engler) 2.2° at 20° C. has been obtained by steam distillation of the acid tar produced by diluting with water the waste acid of petroleum refining. The oil was completely soluble in liquid sulphur dioxide, a proof that the chief function of the sulphuric acid in petroleum refining is to remove unsaturated compounds. Different fractions of the oil separated by vacuum distillation showed no variation in specific gravity. No nitro-derivative could be prepared from the distillate obtained by destructive distillation of the oil, showing that further unsaturated compounds are formed during the decomposition.—L. A. C.

Sulphur in spent oxide. Twisselmann. See VII.

PATENTS.

Burners; Gaseous or liquid fuel —. Alldays and Onions Pneumatic Engineering Co., Ltd., and A. Nicholson, Birmingham. Eng. Pat. 120,770, 21.11.17. (Appl. 17,139/17.)

A GASEOUS or liquid fuel burner is provided with a central fuel supply tube, tapering internally, and tapering or cylindrical externally, at the nozzle end. The flow of fuel is regulated by an axial needle valve. Air is supplied through a concentric outer tube also having a converging nozzle, surrounding the fuel nozzle. The nozzle portion is screwed on to the body portion so as to be adjustable axially to regulate the air, and helical vanes may be provided in the nozzle to give the air a whirling motion. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 12,060 of 1898; this *J.*, 1899, 478.)—W. F. F.

Fuel; Motor —. J. Penhale, Johannesburg. Eng. Pat. 120,792, 3.12.17. (Appl. 17,858/17.)

A FUEL for internal combustion engines consists of alcohol substantially saturated with acetylene, and containing about 1% of acrolein.—W. F. F.

Fuel. L. le W. Hamon, Dublin. Eng. Pat. 121,102, 20.8.18. (Appl. 13,533/18.)

THE fuel consists of lignite, peat, sud, leaf-mould, or shale 50–60%, cellulose 15–20%, silica 12.5–15%, pitch or tar or their residues, or oil residues 20–25%, and alkali 2.5–5%. In a modification, graphite, carbon, anthracite, or coal dust, coke breeze, slag, clinders, or culm, 15–20%, may be added, and the proportions of cellulose and silica reduced, and in another modification, clay ironstone, blackband, iron-sand, manganese ore, or iron oxide, 1–2%, may also be added. The mixture may be briquetted, and may be converted into smokeless fuel by distillation in a retort.—W. F. F.

Gas-producers or other chambers; Apparatus for feeding fuel or other material to —. F. Thuman, Westminster. Eng. Pat. 120,553, 4.5.18. (Appl. 7532/18.)

A REFRACTORY "sounder" rests on the surface of the fuel-bed and is connected at its upper end to a movable section or spout in the inclined channel which feeds the fuel into the distributing hopper. If the fuel bed rises above a predetermined height, the movable section is raised and the fuel supply automatically reduced or cut off. In a modification a "sounder" carried by a lever arm works through a slot in the side of the producer and is connected to the feed-spout.—T. F. E. R.

Coal-gas; Method and means for generating — in retorts. J. and S. Walster, Sheffield. Eng. Pat. 121,146, 24.5.18. (Appl. 15,445/17.)

COAL-DUST is violently agitated, by means of paddles rotated in a suitable chamber, so as to form a cloud or "fog," which is drawn through an off-take pipe by the suction of a gas reservoir or internal combustion engine into a heated retort, where it is immediately gasified. The retort may be heated externally either electrically or by means of oil or gas burners, the gas being supplied from the retort. The exhaust heat from an internal combustion engine may constitute an auxiliary supply for heating the retort.—T. F. E. R.

Producer-gas plants. H. W. Bamber, London. Eng. Pat. 121,161, 30.11.17. (Appl. 17,740/17.)

THE water supplied to the producer for generating steam passes through a regulating device which is

interconnected with the gas-egress valve of the producer or throttle-valve of the engine. The water supply is thus automatically regulated in direct proportion to the amount of gas required for the engine. By an analogous arrangement the water can be supplied to the producer from a float chamber of the carburettor type, the water feed to this chamber from an overhead tank being controlled by a valve which is interconnected with the gas-egress valve of the producer and thereby automatically regulated.—T. F. E. R.

Gas; Process of producing —. B. F. McKee, Arma, Kans. U.S. Pat. 1,282,445, 22.10.18. Appl., 12.12.17.

Gas is generated by feeding carbonaceous material to a rotating vessel having a pair of electrodes embedded in the material, the solid residue being discharged continuously at the bottom.—W. F. F.

Gas; Cooling, cleansing, and filtering devices for —. D. J. Smith, London. Eng. Pat. 121,177, 5.12.17. (Appl. 17,982/17.)

CRUDE suction-producer gas or the like is passed in a zig-zag path through a water-jacketed cooling chamber, issuing from which it impinges on to projecting ribs and then proceeds through a nest or group of tubes, for further cooling, and then through tubes containing wire gauze filters which remove dust and tarry matter. The cooling jacket may be made to supply hot feed water for boiler purposes. Rubber cushions are provided to allow for unequal expansion of the concentric tubes forming the cooler.—T. F. E. R.

[Shale] oil extracting and refining apparatus. E. T. Erickson, Salt Lake City, Utah, Assignor to Rainbow Petroleum Products Co. U.S. Pat. 1,281,320, 15.10.18. Appl., 15.4.18.

CRUSHED oil-bearing shale is passed through narrow metal retorts heated in a furnace. The retorts are spaced at the ends and sides from the walls of the furnace. Perforated pipes are disposed longitudinally in the retorts and are connected in groups by discharge pipes. The pipes leading from the perforated pipes are controlled by valves.—T. St.

Gasoline; Method of manufacturing —. J. B. Weir, New York. U.S. Pat. 1,282,338, 22.10.18. Appl., 11.4.18.

GASOLINE is extracted from natural gas by compression and cooling, and the partially denuded gas is passed through an absorbent hydrocarbon liquid. The derived products are blended and after a portion of the more volatile constituents has been driven off, the product is ready for use as gasoline. The more volatile constituents thus removed are absorbed by a hydrocarbon liquid heavier than gasoline, and this product is used as the absorbent through which is passed the gas remaining after the initial treatment of fresh quantities of natural gas.—T. St.

Lubricants; Process of treating used —. J. O. Handy, Assignor to Pittsburgh Testing Laboratory, Pittsburgh, Pa. U.S. Pats. (A) 1,281,354 and (B) 1,281,355, 15.10.18. Appl., 23.5 and 5.7.17.

(A) USED lubricating oil is clarified, dissolved in a hydrocarbon solvent, and solid suspended matter removed. The solution is decolorised by adsorption, and treated successively with an alkali and an acid. The acid is allowed to separate, the solution neutralised and washed, and finally the

solvent is removed by distillation. (B) The decolorised solution obtained as described under (A) is treated with caustic alkali, washed, and the solvent distilled off.—T. St.

Lubricating oil; Substitute for —. Farb. w. vorm. Meister, Lucius und Brüning. Ger. Pat. 308,385, 3.10.15.

ANHYDROFORMALDEHYDE derivatives of toluidine or xyldine, or mixtures of the same, liquid at ordinary temperatures, may be used for lubricating purposes.—L. A. C.

Peat; Raising and drying —. T. E. Doyle, Dublin. Eng. Pat. 120,850, 23.4.18. (Appl. 6801/18.)

Briquetting [coal, etc.]; Method of — and the product. E. R. Sutcliffe, Leigh, Assignor to Pure Coal Briquettes, Ltd., Cardiff. U.S. Pat. 1,283,354, 23.10.18. Appl., 27.3.15.

SEE Eng. Pat. 5019 of 1915; this J., 1916, 592.

Coke-ovens; Converting beehive — into by-product ovens. B. Zwillinger, New York. Eng. Pat. 121,085, 17.6.18. (Appl. 9977/18.)

SEE U.S. Pat. 1,260,895 of 1918; this J., 1918, 538 A.

Petroleum oils; Process for making lighter from heavier —. C. Ellis, N. L. Foster, and Ellis-Foster Co., Montclair, N.J., U.S.A. Eng. Pat. 121,356, 15.12.17. (Appl. 18,653/17.)

SEE U.S. Pat. 1,249,278 of 1917; this J., 1918, 49 A.

Distillation. Eng. Pat. 120,854. See IIB.

Gas-analysing apparatus. U.S. Pat. 1,281,729. See XXIII.

II.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Distillation; Process of fractional or destructive —. C. Turner, Irlam, Lancs. Eng. Pat. 120,854, 23.11.17. (Appl. 8011/18.)

LIQUIDS such as crude hydrocarbon oils are subjected to fractional or destructive distillation under varying pressures. The pressure is raised by keeping the vessel closed, and then rapidly lowered by opening the vessel. The heating of the vessel is continuous except for the cooling which may occur when the vessel is opened.—W. F. F.

Electrode; Arc-lamp —. I. Ladoff, Wilkinsburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,281,796, 15.10.18. Appl., 20.6.14.

AN electrode, capable of producing a relatively steady arc, is composed of titanium oxide mixed with a uranium compound.—B. N.

Decolorising carbon. Eng. Pat. 121,085. See XVII.

III.—TAR AND TAR PRODUCTS.

Phenol and alkaline liquors; Miscibility of —. R. Dubrisay, Tripier, and Toquet. Comptes rend., 1918, 167, 1636—1638.

A DEFINITE weight of phenol was added to a solution of caustic soda of known strength, and the mixture was heated until solution was effected. On cooling and stirring the solution, a cloudiness forms at a certain temperature, corresponding with the equilibrium point. The coefficient of miscibility was found to increase with increasing concentration of the sodium hydroxide solution from N/20 to N/3, the temperature at which the opalescence appears being gradually lowered from 32.4° C. to 11.8° C. The behaviour of the alkaline-earth bases corresponds with that of the alkalis. Acids and strongly acid salts diminish the miscibility of phenol with water, as also do alkali carbonates, a contrary result to expectations based on the consideration of the hydrolysis of the alkali carbonates.

—C. A. K.

Acetylene condensations. Meyer. See IIA.

Arsenotungstic and arsenotungstomolybdic reagents. Guglielmelli. See XX.

Differentiating naphthols. Palet. See XX.

PATENTS.

4,4'-Diamino-2,2',5,5'-tetramethyltriphenylmethane; Manufacture of —. Farb. vorm. Meister, Lucius, und Brünig. Ger. Pat. 308,785, 9.7.16.

COMMERCIAL xylydine is treated with more than the theoretical amount of benzaldehyde in the presence of acids. The yield of the triphenylmethane-derivative is about 15% of the weight of xylydine.

—L. A. C.

Lubricating oil substitute. Ger. Pat. 308,385. See IIA.

Distillation. Eng. Pat. 120,854. See IIB.

Paint [from pitch]. Eng. Pat. 118,079. See XIII.

Disinfectant. U.S. Pat. 1,282,062. See XIX.

IV.—COLOURING MATTERS AND DYES.

Indole and indigotin groups; Derivatives of — substituted at the nitrogen atom. A. Albert. Annalen, 1918, 416, 240—278.

1-HYDROXY-3-BENZOYLOXY-2-THIO-OXINDOLE (Ber., 1916 49, 1382) only reacts in the thio-form in forming the acetyl derivative. In other reactions it behaves as a thiol. Thus with phenylhydrazine it forms 3-benzoyloxy-2-thioloxindole-1-phenylhydrazone

hydrate, $C_6H_5.NH.N(OH) \begin{matrix} \diagup C_6H_5 \\ \diagdown C(SH) \end{matrix} CH.O.CO.C_6H_5$.

This substance loses its sulphur very easily, N/2-sodium hydroxide converting it into 1.1'-bisphenylhydrazinoinidigotin, red plates decomposing at 237°—240° C. The latter, which appears capable of reacting also in the tautomeric enolic form, is not a vat dye. It undergoes extensive decomposition on reduction but from it can be prepared indigotin-1.1'-imide, $C_{16}H_8O_2N_2$, violet plates decomposing at 185° C., which is a true vat-dye, the

yellow solution obtained by its reduction by alkaline sodium hydrosulphite regenerating the imine by exposure to air. (See also J. Chem. Soc., Feb., 1919.)—C. S.

PATENTS.

Formaldehyde and primary aromatic amines; Manufacture of condensation products of — [for the production of azo-dyes]. A. M. Nastukoff and P. M. Croneberg, Moscow. Ger. Pat. 308,839, 25.12.13.

PRIMARY aromatic amines are treated with formaldehyde, preferably in slight excess, and dilute aqueous mineral acids, such as sulphuric or hydrochloric acid, and heated to the boiling point. Theoretical yields are obtained of pure amino-bases free from oxygen and resin and having definite constant melting points. These bases can be diazotised and azo-dyestuffs can be developed on the fibre giving red, claret, khaki, or yellow shades of excellent fastness to washing, alkalis, and acids.—J. F. B.

β-Anthrimides [vat dyestuffs]; Manufacture of —. Farb. vorm. Meister, Lucius, und Brünig. Ger. Pat. 308,666, 27.8.16.

THE reaction products of β-diazoanthraquinones with ammonia are heated in solvents of high boiling point, with or without the addition of condensing agents. Instead of these derivatives the products of the action of cold alcoholic ammonia on β-diazoanthraquinones, which apparently are analogous to bis-diazobenzeneamide, may be employed. β-Anthrimides are valuable vat-dyestuffs.

—J. F. B.

Azo dyestuffs; Production of —. H. Levinstein, Manchester. U.S. Pat. 1,283,231, 29.10.18. Appl. 14.2.16.

See Eng. Pat. 5344 of 1915; this J., 1916, 630.

Mercury derivatives of phthalicins. Ger. Pat. 308,335. See XX.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Sulphite pulp from spruce; Effect of varying certain cooking conditions in the production of —. S. E. Lunak. U.S. Dept. Agric. Bull. 620. Pulp and Paper Mag., 1918, 16, 815—818, 837—838, 863—864, 889—892.

COMPARATIVE trials were made in an experimental digester, the following factors being kept constant throughout: quantity of spruce chips, 74.2 lb. dry weight; condition of chips, air-dry; quantity of acid liquor, 63 galls.; time to reach 100° C., 2 hours; time to reach maximum temperature, 3 hours. The digester was heated by a closed steam coil, and the pressure was not relieved during the digestion. To determine the end of the digestion process, comparative estimations of the colour of the spent liquor were made, using as standard a coffee extract, clarified by egg-albumin and preserved with formaldehyde. The pulp was blown off, washed 5 or 6 times in the drainer, pressed to about 30% dry weight, passed through a shredder, weighed, and sampled. The main portion was opened out in a beater, diluted, and pumped over a strainer with slots of 0.009 in. in order to determine the weight of screenings. The screened pulp was drained and a portion taken for bleaching trials, while the remainder was brushed out in a beater and made into paper for

colour and strength tests. At a maximum digestion temperature of 135° C. and a constant concentration of 5% of total SO₂, the quantity of combined SO₂ was varied from 0.3 to 2.09%. The results showed that below a certain limit (about 1%) of combined SO₂ digestion was incomplete; the spent liquor darkened without a corresponding digestion effect, the percentage of screenings and the consumption of bleach increased and the colour of the pulp was inferior. On the other hand, increasing the percentage of combined SO₂ beyond 1% had practically no influence on the quality of the pulp, but there was a slight increase in the yield of screened pulp owing to the more thorough digestion. A lower percentage of combined SO₂, however, gave a quicker digestion. Keeping the ratio of free SO₂ to combined SO₂ constant at 4:1, it was found that an increase in the total SO₂ gave a more rapid digestion. The percentage of screenings and colour of the pulp began to be influenced unfavourably when the percentage of total SO₂ was decreased below 5%. Increasing the total SO₂ gave a decreased consumption of bleaching powder. With a standard liquor containing 5% of total and 1% of combined SO₂, lowering the temperature of digestion had a beneficial effect on the yield of pulp, the percentage of screenings, the strength of the pulp, and the consumption of bleach; thus all the advantages connected with a milder treatment were obtained; no influence on the colour of the pulp was observed. On the other hand, the time of digestion was greatly prolonged at the lower temperature, 25 hours being required at 110° C. as compared with 5 hours at 140° C., but the longer time permitted a more uniform action and gave a well digested pulp comparatively free from "shives."—J. F. B.

"Sulphite acid" [for wood pulp manufacture]; Analysis of —. P. Klason. Swedish Pulp and Paper Engineers' Assoc. Pulp and Paper Mag., 1918, 16, 1015–1018, 1037–1039.

THE composition of the fresh acid sulphite liquor is expressed in terms of "free" and "combined" SO₂, as ascertained by iodometric and acidimetric titrations performed either on the same sample (Holm's method) or on separate portions (Winkler's method). The analysis of the exhausted or partially exhausted liquor in the control of the digestion process is complicated by the presence of SO₂ in a loosely combined or reversible form, which affects the alkali titration in the same manner as the half-bound SO₂ (calcium bisulphite) but does not appear as a sulphite until it has been treated with excess of alkali. It is proposed therefore to supplement either of the above methods by a second iodine titration made after treating the liquor with excess of alkali and re-acidifying. The three titrations then afford data from which may be calculated the completely free SO₂, the half-bound SO₂, which indicates the available SO₂ capable of combining with lignin, and the loosely combined SO₂. The last-mentioned form of SO₂, which becomes active after treatment with caustic alkali, reacts more slowly with calcium and barium hydroxides and still more slowly with ammonia. It does not react at all in the cold with calcium carbonate, but to a small extent on heating. It is impossible, therefore, to neutralise a spent sulphite liquor with calcium carbonate alone, because the "reversible" SO₂ exercises an acidity equivalent to half its value. On neutralising carefully with lime the decomposition of this form of combination can be observed by the reappearance of acidity after the first neutral point has been reached, until a stable point of neutrality is obtained. Another obstacle to direct neutralisation is the hydrolytic dissociation of the normal calcium sulphite as it is first formed, the hydroxyl ions thus liberated establishing the

apparent neutral point before true equilibrium is reached. As the precipitate becomes stable, the hydroxyl ions disappear and the liquor turns acid. In the first iodine titration only the free and half-bound SO₂ are determined, but these being removed the "reversible" SO₂ comes into play to a slight extent, and it is found that the blue colour indicating the end point is not permanent. The principal error in the analytical methods for controlling the digestion liquor is that due to organic acids which make the alkali titration too high; consequently, as the organic acids accumulate towards the end of the digestion, low results are obtained for the half-bound (available) SO₂, and high results for the completely free SO₂. The error in the alkali titration cannot very well exceed 0.2 c.c. N/10 for 1 c.c. of liquor and is greatest in the case of spent liquors. Towards the end of the digestion, the value for the available, i.e., half-bound SO₂, may sink to zero or become negative; in that case the digestion is completed by means of the fully free SO₂, and the calcium lignosulphonates will not be fully saturated with calcium. In such a case it is probable that the loosely combined sulphite comes into play and furnishes calcium to assist in the dissolving process. The Mitscherlich test with ammonia is useful in a qualitative sense; the quantity of the precipitate does not depend on the quantity of calcium but on that of the SO₂, nevertheless when the quantity of precipitate ceases to decrease, no more dissolving action can take place, and if this point occurs before digestion is complete it indicates an original deficiency of calcium. The author does not accept Oman's proposals in connection with this test (this J., 1916, 172, 832), and states that "black" charges are not caused by an excess of free SO₂, which can be very high without danger, provided sufficient calcium bisulphite is present to combine with all the unsaturated components of the lignin.—J. F. B.

Wood cellulose as fodder. Schwalbe. See XIX.

Water softening. Chambers. See XIX.

Nitration of cellulose. Hervé. See XXII.

PATENTS.

Fibrous materials; Drying machine for —. F. G. Sargent, Westford, Assignor to C. G. Sargent Sons Corporation, Graniteville, Mass. U.S. Pat. 1,281,667, 15.10.18. Appl., 20.12.17.

THE drying machine comprises a casing in which are situated means for supporting the stock to be dried. Air is drawn from the outside by means of intake fans, which deliver it into the casing and through the stock. The air is heated immediately it is drawn in, and means are provided for exhausting the air from the casing. An interior casing or passage is located in position to receive the air as it passes through the stock and direct it back to the intake fans, and means are provided for controlling the passage of air through the interior casing.—J. F. B.

Paper; Method of utilising old — for the purpose of producing new paper. J. A. van den Knapp, Selligen, and B. J. Bartelds, Apeldoorn, Holland. Eng. Pat. 111,860, 7.12.17. (Appl. 18,181/17.) Int. Conv., 7.12.16.

WASTE printed paper is cleaned, reduced to a pulp, mixed with cold water in a beating engine, and washed therein by means of a drum washer. When the paper is completely pulped and most of the ink removed, the stuff is mixed with soap solution

in the proportion of 250 grms. of soap per 100 kilos. of dry pulp. It is then fed into boiling tubs wider at the top than at the bottom in which are suspended a certain number of open steam pipes, inside which are situated water pipes with perforated orifices at the bottom of the tub. The mixture is boiled for half an hour and the fibres are allowed to settle; the grease and dirt collect at the top and are removed by an overflow when steam and water together are introduced at the bottom of the tub. The admission of hot water is repeated intermittently until the pulp is completely cleansed. (Compare Eng. Pat. 13,269 of 1902; this J., 1903, 646.)—J. F. B.

Paper pulp; Tub-beaters for — C. W. Unkle and T. D. Griley, Baltimore, Ohio, U.S.A. Eng. Pat. 116,695, 9.5.18. (Appl. 7783/18.) Int. Conv., 15.6.17.

In a beating engine the roll is enclosed by a hood having a flattened portion at the side opposite the backfall. The flattened portion of the hood is perforated and a series of plates having sharp edges is reciprocated by means of a rod across the perforations in the flat portion, so that when the perforations become clogged the protruding particles of paper pulp are cut away and the holes are cleared. During the beating of the pulp, the fibres are thrown by the centrifugal action of the roll against the perforated flattened portion of the hood and the finer, fully beaten fibres pass through the holes, while the coarser particles are returned to the roll. The finely beaten stuff is collected in a gutter extending across the beater and is discharged into a receptacle outside.—J. F. B.

Sea-tang; Method of obtaining paper pulp and fibrous material from — V. Frydensberg, Tidsvildeleje, Denmark. Eng. Pat. 120,761, 19.11.17. (Appl. 17,008/17.)

FRESH, moist sea-tang is bleached by exposure to chlorine or preferably by spreading it out in layers or heaps and sprinkling with bleaching powder and a little acid, or else by steeping in dilute bleach liquor. The bleached or unbleached sea-tang is dried in the air and then reduced by crushing, rubbing, tearing, or carding to a fibrous mass which may be used for the manufacture of paper or for strengthening plaster, stucco, etc.—J. F. B.

[Cardboard] tubes; Coating the interior surfaces of — G. H. Hadfield, Mitcham, and A. E. Bawtree, Sutton, Surrey. Eng. Pat. 120,934, 26.11.17. (Appl. 8921/17.)

IN treating the interior surface of a tube with a colloid in order to render it impervious, the material of the tube is treated at any stage of its manufacture with a hardening agent before the colloid is applied. For instance, a cardboard tube made from paper which is impregnated with alum is coated by means of a revolving brush with a hot 10% solution of gelatin.—J. F. B.

Paper; Process of coating — C. M. Gage, jun., East Pepperell, Mass. U.S. Pat. 1,282,564, 22.10.18. Appl., 12.11.15.

A MAIN coating of the finishing material is first applied to the paper, and the material is forced into the pores of the paper and spread evenly over the surface by appropriate means; it is then partially dried by blasts of air, and the partially dried coated surface of the paper is passed over a smooth roll which revolves at the same surface speed as the speed at which the paper moves forward. The coated face of the paper is pressed lightly against the roll to eliminate any wavy formation resulting from the partial drying, and a

second coating of the same material as the first coating is then sprayed on to the coated face of the partially dried paper, which is afterwards dried in the usual way.—J. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Mordant dyestuffs in calico printing. H. Pomeranz. Monatsschr. Text.-Ind., 1918, 33, 30—31, 38, 45—46. Z. angew. Chem., 1918, 31, Ref., 350.

THE author discusses the manner of the fixation of acid mordant dyestuffs in calico-printing, particularly of alizarin. The formation of the colour-lake on the fibre under the action of steaming is the result of a mutual reaction between the fibre, mordant, and dyestuff, leading to the production of a colloidal colouring matter, which in itself has the property of dyeing the fibre but which does so still better through the part played in its formation by the colloidal alumina deposited in the fibre. According to Liebermann's researches, no stoichiometrical relations exist between dyestuff and mordant. The oil exists both as a constituent of the colour-lake and in a peculiar form of direct combination with the cotton. Before the appearance of Turkey-red oil, the author employed oil in the printing colour for goods not prepared with oil. He used ricinoleic acid emulsified with saponin and the colour was thickened with starch and gum, the starch being gelatinised by heating together with the oil and gum. The portion of the oil mordant intended to enter into combination with the colour-lake was added to the printing colour in the form of calcium ricinoleate.

—J. F. B.

Water softening. Chambers. See XIXa.

PATENTS.

Textile materials; Process for the production of foam baths for treating — P. Schmid, Basle, Switzerland. U.S. Pat. 1,281,670, 15.10.18. Appl., 27.11.17.

ALKALIS and "wastes of common trees" are added to the liquid which is to be transformed into foam, and the mixture is boiled.—J. F. B.

Sevicin soap [for silk dyeing]; Manufacture of a substitute for — P. Schmid, Basle, Switzerland. U.S. Pat. 1,284,152, 5.11.18. Appl., 15.2.18. See Ger. Pat. 305,239 of 1917; this J., 1918, 464a.

Condensation products [for azo dyes]. Ger. Pat. 308,839. See IV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Potash [from lakes] in Nebraska. J. M. Litteras. Chem. and Met. Eng., 1918, 19, 633—634.

THE present field on which pumping operations are carried out extends over an area of about 330 sq. miles. It has been proved by the continuous pumping of certain lakes that the potash supply of Western Nebraska is not inexhaustible, as the density of the water falls after a certain length of time. If the lakes however are allowed to "rest" the density of the water increases and in rare cases may attain the original value. As the small lakes are scattered, the brine is conveyed

to a central station, and evaporated in Devine or triple-effect Swenson evaporators. Difficulty has been experienced in drying the salts and the most successful plant consists of a cylindrical shell, 30–45 ft. long and 4–6 ft. in diameter. The concentrated brine is sprayed into the upper end of the cylinder and travels towards the heated end, loose rollers and baffles preventing any adherence of the dried salts. The gases and dust pass from the cool end of the dryer through a dust-collecting chamber and thence to a chimney. Nebraska is now producing about 450 tons of salts daily with an average potash content of 25% K₂O. —C. A. K.

Potassium salts; Carnot's method for the estimation of —. C. E. Spegazzini. Anal. Soc. Quim. Argentina, 1918, 6, 196–209.

ANALYSES according to the original method of Carnot (Comptes rend., 1878, No. 7) for the precipitation of potassium bismuth thiosulphate gave results in every case much too high. The method as modified by Grandeau and by Fresenius also gave high results. It is essential in the preparation of bismuth chloride solution from the subnitrate to give particular attention to the acidity and temperature of the resulting solution, the optimum acidity being determined by precipitation of a In the case of potassium chloride good results were known quantity of potassium from N/10 solution, obtained only with pure dilute solutions (N/10–N/1). Nitrate solutions also gave good results, but with sulphate solutions the results were much too low. With mixtures of potassium chloride with calcium chloride, magnesium chloride, or sodium chloride the method is satisfactory only when the potassium salt is in excess.—W. S. M.

Carbon dioxide in carbonates; Determination of —. D. D. Van Slyke. J. Biol. Chem., 1918, 36, 351–354.

THE carbonate is placed in a test-tube which is inserted into a suction flask containing a known volume of N/10 barium hydroxide solution. The flask is closed by a rubber stopper carrying a dropping funnel the bottom of which is arranged to dip into the test-tube. The flask is evacuated, excess of acid is allowed to drop into the test-tube, and after agitation by rotation for about 3 minutes (two hours in the case of animal tissues such as bones, pulverised but not ashed), all the carbon dioxide will be found to have passed from the inner tube into the barium hydroxide. The precipitated barium carbonate is filtered off, and the excess of barium hydroxide in the filtrate determined by titration with N/10 hydrochloric acid, using phenolphthalein as indicator. The method appears to be applicable to all carbonates, soluble or insoluble, in the absence of acids, such as hydrogen sulphide, which are highly volatile from aqueous solution. (See further J. Chem. Soc., Feb., 1919.)—H. W. B.

Bisulphites of sodium and calcium; Apparatus for the manufacture of pure —. H. J. Paoli. Anal. Soc. Quim. Argentina, 1918, 6, 121–128.

THE process is based on the action of excess of sulphur dioxide on wet crystals of sodium carbonate, Na₂CO₃·10H₂O. The sulphur dioxide is generated in a sulphur burner of simple construction of which drawings to scale of two alternative types are given. The gas passes through several layers of wet carbonate crystals supported at different levels in a reaction tower. The liquor drawn off from the bottom of this tower is a solution of sodium bisulphite of 30° B. (sp. gr. 1.262). The gases then pass to a second tower packed with

earthenware cylinders down which flows a saturated solution of sodium carbonate. The liquor from the bottom of this tower is elevated to the top, and the circulation is maintained until a pure bisulphite solution can be drawn off. A scale drawing of the plant is given.—W. S. M.

Aluminium hydroxide; Solubility of —. E. H. Archibald and Y. Habasian. Trans. Roy. Soc. Canada, 1917–18, [iii], 11, 1–6.

ALUMINIUM hydroxide is appreciably soluble in solutions of ammonia, thus a N/10 solution of ammonia dissolves 0.240 gm. of Al(OH)₃ per litre at 20° C. The solubility increases with increasing concentration of ammonia to a maximum which is reached at N/2 (0.450 gm. per litre). The presence of ammonium nitrate decreases the solubility, the decrease being greater the larger the concentration of ammonium nitrate and the higher the temperature. Potassium nitrate increases the solubility to a marked degree. In the quantitative estimation of aluminium only a small excess of ammonia should be used, and the precipitate should be washed with a 10% solution of ammonium nitrate. (See J. Chem. Soc., Feb., 1919.)—J. F. S.

Magnesium ammonium phosphate and magnesium pyrophosphate; Some properties of —. Z. Karaoglanow and P. Dimitrow. Z. anal. Chem., 1918, 87, 353–371.

THE conversion of magnesium ammonium phosphate into magnesium pyrophosphate may or may not be accompanied by the phenomenon of incandescence, depending upon the conditions under which the magnesium ammonium phosphate is precipitated. The product will not incandesce if precipitated slowly at the boil, but will do so if formed quickly or at lower temperatures. It has been found that incandescence never takes place if all traces of organic matter are carefully excluded from the precipitate. The properties of magnesium pyrophosphate depend upon whether it is formed with or without incandescence. If incandescence occurs, the product is hard and lava-like, and grey to black in colour, whilst if there is no incandescence, it is amorphous, loose in texture, and quite white. (See also J. Chem. Soc., Feb., 1919.)

—E. H. R.

Ammonium chloroplatinate, bromoplatinate, and chloroiridate; Solubility of — and the separation of platinum and iridium. E. H. Archibald and J. W. Kern. Trans. Roy. Soc. Canada, 1917–18, [iii], 11, 7–16.

THE solubility of ammonium chloroplatinate, bromoplatinate, and chloroiridate in water increases continuously with the temperature, the two first salts being approximately ten times as soluble at 100° C. as at 0° C. Ammonium chloroiridate is several times more soluble than the chloroplatinate under the conditions of precipitation; a separation of platinum and iridium can be obtained, therefore, by the precipitation of the ammonium chloroplatinate. The solubility of all three salts in solutions of their corresponding halide salt is very small. Ammonium chloroplatinate is appreciably less soluble than the potassium salt. (See also J. Chem. Soc., Feb., 1919.)—J. F. S.

Spent oxide; Determination of the free sulphur content of —. N. T. Twisselmann. Chem.-Zeit., 1918, 42, 588. (See also this J., 1918, 336 r, 690 a.)

FIVE grms. of the finely powdered material is extracted for 1.5 hr. with carbon bisulphide, the

solvent is then distilled from the extract, the residue of impure sulphur dried at 100° C., and weighed. The residue is then dissolved in carbon bisulphide, the solution filtered, the filtrate evaporated, the residue dried at 100° C., weighed, and ground to a fine powder; 0.5 gm. of this powder is ignited in a porcelain crucible until all sulphur has volatilised, and the non-volatile residue is weighed and its weight deducted from that of the impure sulphur.—W. P. S.

Flowers of sulphur and sublimed sulphur. Noyer. Caoutchouc et Gutta-Percha, 1918, 13, 9661–9663.

THE conflicting descriptions given by different writers of the product obtained by condensing sulphur vapour in refining chambers have led the author to make a careful examination of the material so obtained. The deposit on the floor of the condensing chamber consists of a number of stratified layers corresponding to the number of times the retort has been charged. The deposit is not homogeneous, and four different varieties may be distinguished. The first or utricular variety consists of globules of varying size formed by condensation of the hot vapour in the cold chamber. This is followed as the chamber becomes hotter by a variety having a crystalline appearance, a conglomerate of globules and crystals. The third variety is a light, friable, spongy mass, mainly crystalline, and the fourth forms hard compact masses in the neighbourhood of the mouth of the retort. The different commercial varieties are obtained by sifting the product. Good "flowers of sulphur" should contain a maximum of sulphur insoluble in carbon bisulphide. Commercial products examined by the author contained from 13 to 33% of insoluble sulphur, whilst a sample of the pure "utricular" form direct from the condensing chamber contained a maximum of 37% of insoluble sulphur, which on long keeping diminished to 33%. It is suggested that the term "flowers of sulphur" should be reserved for samples containing a minimum of 33% of sulphur insoluble in carbon bisulphide. Other samples should be sold as "sublimed sulphur" containing a stated percentage of "flowers" based on the proportion of insoluble sulphur present.—E. H. R.

Estimating sulphate ion. Howden. See XXIII.

PATENTS.

Calcium cyanamide; Method of making —. G. E. Cox, Niagara Falls, N.Y., Assignor to American Cyanamid Co., New York. U.S. Pat. 1,282,381, 22.10.18. Appl., 3.12.17.

A PERFORATED container is inserted into a furnace and is then charged with a finely divided carbide. The temperature of the mass is raised sufficiently in the presence of nitrogen to bring about the formation of calcium cyanamide.—J. H. J.

Cyanides; Process of preventing the decomposition of molten —. H. Freeman, Niagara Falls, Ontario, Assignor to American Cyanamid Co., New York. U.S. Pat. 1,282,405, 22.10.18. Appl., 20.4.18.

A MIXTURE of sodium chloride and "lime nitrogen" (crude calcium cyanamide) is fused in an electric furnace, and the mixture tapped from the furnace and rapidly cooled to a temperature below redness. The product, in the form of thin flakes, contains more than 30% of sodium cyanide, mixed with calcium chloride, sodium chloride, and lime.

—W. F. F.

Pumps for acids. U.S. Pat. 1,282,145. See I.

VIII.—GLASS; CERAMICS.

Glazes on zinc retorts. Mühlhaeuser. See X.

PATENTS.

Glass; Drawing —. A. E. Spinasse, Mount Vernon, Ohio, U.S.A. Eng. Pat. 114,819, 26.11.17. (Appl. 17,474/17.) Int. Conv., 12.4.17.

THE end of a hollow metal bait or blow-pipe is heated to about 200°–480° C., and is then lubricated with rosin, tallow oil, wax, powdered lime, magnesite, or the like to prevent the glass adhering to it, dipped into the molten glass, and withdrawn in the customary manner. Alternatively, a hollow bowl-shaped bait may be lubricated as above, filled with glass, and air under pressure introduced into the bait before withdrawing it. By keeping the glass out of direct contact with the warm bait, the former remains plastic, is less liable to crack, and its surface is under less tension than usual. A bait with its end constructed in sections may be used.

—A. B. S.

Oil-fired glory-hole and like furnaces. Burdous, Ltd., and W. M. Burdon, Bellshill, Lanark. Eng. Pat. 121,100, 9.8.18. (Appl. 12,956/18.)

A FURNACE for use in glass bottle manufacture is heated by oil supplied through a Burdon burner into the central firing chamber, the gases then escaping at right-angles to chambers at each side of the furnace. From these chambers the gases pass upward around the glory-holes through restricted flues and again at right-angles to a central outlet flue and to a recuperator in which they heat the air required for the combustion of the oil. Glassware in the glory-holes does not come into contact with the products of combustion.—A. B. S.

Clay; Treatment of —. W. Feldenheimer, London. Eng. Pat. 121,191, 6.12.17. (Appl. 18,116/17.)

CRUDE china clay is suspended in water to which has been added a deflocculator such as sodium carbonate or tannic acid. The coarser impurities are allowed to settle out and the liquid is transferred to another vessel and a flocculator, such as alum or sulphuric acid, is added sufficiently slowly to cause coagulation but not rapid settling. The material settles to form two layers, the upper being clay and the lower foreign matter; these are separated in any convenient manner. The clay may be deflocculated as described and afterwards coagulated by the addition of a strong solution of the deflocculating agent. The colour of the product may be improved by adding ultramarine to the suspended clay prior to its coagulation.—A. B. S.

Kilns or ovens for pottery, tiles, and other ware. J. S. Maddock, Newcastle, and W. E. Maddock, Wolstanton, Staffs. Eng. Pat. 121,198, 13.12.17. (Appl. 18,463/17.)

THE kiln consists of a renewable vertical shaft or chamber surrounded by a combustion chamber and a series of annular flues and air passages, the whole being surrounded by a permanent structure of non-conducting material. The combustion chamber is situated about midway of the height of the kiln, and the fire or flames from it pass around the central chamber and through the annular flues to the chimney. Cold air is blown by a fan into a space surrounding the top of the central chamber and travels down through an outer pipe and then spirally upwards through the annular air passages into the combustion chamber. The goods are carried on projecting shelves which are supported on a vertically movable table of refrac-

tory material or on an expansible ring at the bottom of the kiln. In order to place more goods in the kiln the lowest shelf is supported on the expansible ring, the table is then lowered, a new loaded shelf is placed on the table, and the latter is raised until it supports the whole of the goods in the kiln. The expansible ring is opened and the table is raised still further so as to cause the fresh goods to enter the kiln. Simultaneously a set of finished goods is raised above the top of the kiln and may be removed. In this manner each shelf with the goods thereon rises step-wise through the preheating, firing, and cooling zones of the kiln. As the combustion occurs in the central chamber or shaft of the kiln, no saggars are needed to protect the goods.—A. B. S.

IX.—BUILDING MATERIALS.

PATENT.

Road surfacing material, and process of producing and laying the same. G. Ross, Kansas City, Mo., U.S.A. Eng. Pat. 120,961, 26.11.17. (Appl. 17,427/17.)

SEE U.S. Pat. 1,252,722 of 1918; this J., 1918, 151 A.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron; Electrolytic deposition of — from organic solvents. E. H. Archibald and L. A. Piguet. Trans. Roy. Soc. Canada, 1917—18, [iii], 11, 107—112.

SOLUTIONS of ferric chloride in acetone, ethyl alcohol-acetone, and water-acetone on electrolysis deposit the whole of the iron. In the case of acetone and acetone-water solutions the iron is free from carbon. At low voltages the iron is deposited in the metallic condition but as the voltage rises it is obtained as an adherent red deposit. From acetone-alcohol solutions the iron although completely deposited is contaminated with carbon. From acetone-water solutions of ferrous sulphate the iron can be completely deposited, but the deposit contains a considerable amount of carbon.—J. F. S.

Iron and steel; Oberhoffer's etching reagent for the detection of areas high in phosphorus in —. K. Harnecker and E. Rassow. Stahl u. Eisen, 1918, 38, 1079—1080.

THE modification of Stead's reagent due to Oberhoffer (Stahl u. Eisen, 1916, 798—9) reveals clearly high- and low-phosphorus areas. Bauer's statement that the reagent produces a negative of the copper-ammonium chloride etching is confirmed. Etched with the Oberhoffer reagent the low-phosphorus primary dendrites of a steel casting appear dark against the higher-phosphorus background when the illumination is vertical, a negative of this being obtained when the light falls obliquely. A soft iron bar with a high-phosphorus core etched with Oberhoffer's reagent shows a perfect negative of the same section etched with copper-ammonium chloride, the illumination being vertical in both cases.—F. C. Th.

Steel; Magnetic permeability of —. F. P. Fahy. Chem. and Met. Eng., 1918, 19, 247—250.

THE magnetic characteristics of iron and steel are increasingly important in the construction of electrical machinery. At the present time parti-

cular attention is being given to research work on permanent magnet material to meet the increased demand for magneto construction, and on the substitution of chromium for tungsten as the principal alloying element. Material for this class of work is practically always used in the heat-treated condition, and sometimes is also subjected to a thermal or mechanical ageing process. Both the "residual" induction and the "coercive force" must be determined in order properly to determine the quality of the material examined. In an open circuit, such as a magneto, the poles of the magnet exert a demagnetising influence and reduce the induction, which is then termed "remanent induction." Magnetic data furnish valuable information as to the structure and characteristics of magnetic materials and supplement the use of the microscope and chemical tests. Burrows (Bull. Bureau of Standards, 13, 207; Sci. Paper No. 272) has shown the wide changes in magnetic properties during heat treatment. The development of apparatus for the magnetic analysis of materials has been backward, and the difficulty in obtaining accurate measurements of the magnetising force is increased by the presence of joints, for which compensating adjustments have to be made. Most of the available permeameters are inaccurate and cannot be relied upon even for comparative determinations, except when the specimens are practically of the same kind.—C. A. K.

Gold amalgams. N. Parravano. Atti R. Accad. Lincei, 1918, 27, ii, 168—170.

THE results of experiments on the distillation of mercury on to gold and on the evaporation of mercury in a current of hydrogen lead to the conclusion that gold amalgams contain at least two compounds, Au₂Hg, and Au₃Hg. (Compare J. Chem. Soc., Feb., 1919.)—T. H. P.

Zinc retorts; Glazes on —. O. Mühlhauser. Metall und Erz, 1918, 15, 393—395.

WHEN zinc distilling furnaces are heated with coal rich in iron, the volatile matter and dust from the fuel may attack the retorts and interior of the furnace, forming glaze-like materials which eventually collect into drops. If the glaze falls from one retort on to a lower one it may cause extensive erosion. Analyses of several "glazes" are given. Their composition varies with the fuel and the conditions in the furnace. The "glazing" of the retorts is advantageous, as it restricts loss due to diffusion of zinc vapour through the wall of the retort; hence natural gas and Mond gas appear to be undesirable fuels, because their freedom from fine-dust precludes the formation of "glazes." These gases might be utilised, however, if a suitable artificially prepared glaze could be applied to the retorts.—A. B. S.

Zinc; Electrolytic precipitation of —. D. McIntosh. Trans. Roy. Soc. Canada, 1917—18, [iii], 11, 113—119.

THE following conditions must be observed for the best results in the electrolytic deposition of zinc from solutions of the sulphate. (1) The solution must be absolutely clear and free from colloids. (2) The iron content should be low, and arsenic, antimony, copper, cobalt, nickel, and in general metals more electropositive than zinc must be absent. (3) The solution, particularly in tanks containing large amounts of acid, should be cold. The zinc is deposited in a semi-passive form; but when it begins to dissolve solution cannot be stopped in any simple way. (4) The zinc concentration should be as high as possible (6—7%) and no attempt should be made to electrolyse solutions

containing less than 1.5–2.0% of zinc. (5) With the ordinary cascade system the optimum current density is 25–30 amperes per sq. foot.—J. F. S.

Copper; Influence of antimony on the mechanical properties of —. W. Stahl. Metall. u. Erz., 1918, 18, 395–396.

THE presence of 0.3–0.4% of antimony in pure copper increases the hardness and general value of the metal. Admixture of 0.15% of nickel and 0.15% of antimony also increases the hardness and quality of the metal provided that any flakes of oxide formed are removed by careful "poling" during the refining of the copper. In copper alloys containing more than 2% Ni, antimony is harmful. It is also harmful in copper containing manganese. In smelting copper containing 0.05% Bi, sufficient antimony should be added to convert the bismuth into an antimonate. In the presence of lead, antimony acts detrimentally on copper, unless the lead is present as antimonate.—A. B. S.

Alloys (brass); Comparison of internal strains of — after quenching and after cold drawing. A. Portevin. Comptes rend., 1918, 167, 1033–1036.

THE internal strains produced by the rapid cooling of metal cylinders have been previously studied (this J., 1918, 704 A), and the same method was utilised in the determination of strains produced in the cold drawing of metals. The hard surface of quenched steels prevented determinations on that material, and comparisons were made on an ordinary brass. The exterior of the quenched bar is in a state of compression, successive inner layers showing a gradual reduction in compression, until a condition of longitudinal strain is found, which increases to a maximum at the centre of the bar. The cold-drawn metal showed surface cracks and was readily fractured by small bending stresses. The strains were found to be the inverse of those of the quenched bar, the exterior being in a state of tension. An almost exactly similar curve was obtained but of inverse character. It has been found possible to reverse the sense of the stresses by quenching a drawn bar, and after a preliminary quenching, a greater amount of drawing can be performed than on the unquenched metal.—C. A. K.

Nickel; New method for determining the allotropic transformation of —. Jänecke. Z. angew. Chem., 1918, 31, 229.

ALLOTROPIC changes in metals are accompanied by a change in the rate of expansion, but this is so small as to be difficult to detect. The following method allowed the change to be observed over short as well as long intervals of time. A nickel cylinder 45 cm. high was inserted in a low-power press (3000 kilos.) used for tensile and compressive strength tests, and heated by means of a resistance furnace; the variation in length produced a movement of the upper movable plate of the press and was registered on a scale indicating movements as small as 0.007 mm. The transformation temperature of nickel was found to be 347°–356° C.; the expansion graph consists of two straight lines, that above the transformation temperature being more steeply inclined.—W. R. S.

Aluminium and its light alloys. P. D. Merica. Chem. and Met. Eng., 1918, 19, 135–140, 200–202, 329–335, 587–592, 635–640.

A résumé of the production, uses, and properties of the metal and its light alloys. About one-third of the total production of aluminium is utilised in the motor industry. The microstructure of aluminium is simple, consisting of crystals in which grains of the iron-aluminium compound, FeAl_3 , and of silicon, are formed; the metal under-

goes no thermal or other transformation in the solid state. It is stated that sea-water has less action on aluminium than on iron, steel, or copper. Protection against corrosion by electroplating is questionable, as the coatings do not adhere satisfactorily, and all the metals used are electro-negative to aluminium. The application of a paint or varnish is a more promising solution. For castings an alloy of aluminium with copper, zinc, or other metal is usually employed, and care must be exercised, as above 800° C. porous castings result from the absorption of gases by the molten metal. Aluminium may be readily rolled, drawn, or hammered, with subsequent annealing. When worked cold, the tensile strength is increased and the ductility reduced, but the original properties may be restored by annealing at 300°–500° C. A compound, CuAl_2 , is formed with the copper, the eutectic mixture at 545° C. containing 32% Cu. The tensile strength increases with increase in copper, but the alloys are subject to severe corrosion in sea-water. Magnesium-aluminium alloys are too brittle for rolling if the magnesium exceeds 6%. This series of alloys (magnalium) is lighter than aluminium, but has never become commercially important for rolling purposes. Aluminium-manganese-copper alloys have similar properties to the aluminium-copper series and are, in common with all aluminium alloys, less resistant to corrosion than the pure metal. Alloys with nickel, and with nickel and copper, show a high ductility, but are not sufficiently strong for structural shapes. Corrosion is rapid, particularly in dilute organic acids. It has been found possible to draw aluminium-zinc alloys containing as much as 26% Zn, but excessive work upon the alloy, or increase in temperature, impairs the tensile strength. Schirmelster (this J., 1916, 894) has observed that most metals form compounds with aluminium, the solubility of the compounds in the pure metal being generally almost zero. The prominent exceptions are zinc, copper, and magnesium. The light alloys of these metals contain only small quantities of the added metal, as with increasing amounts the alloys rapidly become brittle. The light alloys are usually heterogeneous, crystals of the aluminium compound occurring in a ground mass of almost pure aluminium. In commercial practice aluminium-copper or aluminium-zinc-copper alloys have been most largely used for castings, while for forging purposes, "duralumin" (Wilh., this J., 1911, 692) is the best. The general practice in casting follows that employed for brass, and a low casting temperature is favoured. Two of the most largely used alloys are "No. 12," containing 8% Cu, and "No. 31" (Zn 15%, Cu 3%, Al 82%). Rolling and forging alloys contain less of the hardening metal and may be instance by the alloy containing 1–2% Cu and 1% Mn. "Duralumin" is probably the best known of all the light alloys of aluminium, and alone has the feature that the mechanical properties may be improved greatly by heat treatment. The composition is given as Cu 3.5–5.5%, Mg 0.5%, Mn 0.5–0.8%, aluminium, balance. It can be readily rolled and forged, and its physical properties are improved by the application of mechanical work to it. When hardened by quenching, duralumin is remarkably resistant to corrosion. A comparison of the density and mechanical properties shows that weight for weight the aluminium light alloys are as strong as the best steels and for the same strength give greater rigidity.—C. A. K.

Metals used in aeroplane construction; Metallurgy and heat treatment of —. F. Grotts. Chem. and Met. Eng., 1918, 19, 121–128, 191–196, 241–247, 315–319, 583–588.

AEROPLANE construction involves the use of aluminium, copper, bronze, brass, cast iron, and steel,

of which the latter, in the form of carbon or alloy steel, is the most important. An outline of the methods employed in heat treatment and metallographic examination is given, the results of such examination showing that irregularities in low-carbon steel are very common, and are due to strains set up in the metal by bending or welding without subsequent proper annealing. The principal defects found in medium-carbon steel are pipes and slag inclusions; variation in crystal size and brittleness caused by pickling are minor defects. Cable wire and springs made from high-carbon steel often show fine cracks after quenching. A steel containing 0.55% C and 0.85% Mn is recommended for shock-resisting properties. For high tensile strength chrome-nickel steel is employed, as it possesses greater hardening and wearing power than carbon steels, and a double process of quenching is suggested to avoid surface cracking. Inclusions of manganese sulphide and silicate are common, and lead to lines of weakness in the metal. Piston pins and connecting rods are made from chrome-vanadium steel, which has a very fine tough structure when properly heat-treated. Manganese sulphide inclusions and seams containing oxide particles surrounded by partially decarburised metal often occur. Nickel steel is extensively used for bolts, nuts, and other parts subject to shock, as the ferrite increases in strength with the solution of nickel, but it is very susceptible to oxidation during treatment, and is subject to piping and slag inclusions. Chromium steel is of particular value by reason of its non-corrosive properties, and vanadium steel is good for parts which are fabricated by punching. Tungsten steel is made into exhaust valves and cutting tools owing to its property of retaining its hardness even at a dull red heat. Copper is chiefly used in the form of sheets and tubing and is subject during use to bending by vibration. Straining of the metal by hammering is liable to induce cracks. Bronze, gun-metal, Monel metal, and brass often suffer from faulty brazing, the metal being overheated or "gassed." A brass containing 78–82% Cu was found to make the strongest joint, and the best brazing was obtained with standard brazing material, using an acetylene torch. All the joints tested were weaker than the tubing itself, but the brazed joints were stronger than similar welded joints. Heat treatment greatly strengthened the brazed or welded junctions.—C. A. K.

Flotation apparatus; Design and operation of —
A. W. Fahrenwald. Chem. and Met. Eng., 1918,
19, 77–82, 129–134.

MACHINES in which the mineral sought is recovered by forming a froth or foam may be classified into:—
(1) Straight mechanical frothing machines, (2) mechanical-air frothing machines, (3) pneumatic frothing machines, (4) gravity frothing machines. In the first type, agitation is entirely produced by mechanical stirrers, the pulp travelling from one section (spitzkasten) to another and the froth being collected from the surface. Concentrate is taken from the first few spitzkasten, the remainder yielding "middling," which may be returned to the head of the machine. In the second class, in addition to mechanical agitation, air under pressure is admitted to the pulp conduits and aids in lifting the mineral matter. The top of the agitating compartment is closed, and the current of air assists in the removal of the froth. In one type of machine no partitions are used; the froth collects over the whole surface and flows off both sides into receivers. Pneumatic frothing depends wholly on emulsification by air, which may start in the tube mill or in the mixer. The agitating chamber is usually fitted with a porous bottom through which air at about 5 lb. pressure is forced, a uniform water level being maintained throughout the operation. Cells may

be worked either in series or in parallel, though when working on a heavily mineralised ore, the series arrangement is advantageous. The Cole-Bergman machine is fitted with a grate through which air for emulsification is forced, this form of distributor replacing the carborundum porous medium of another type. The tailings in the first chamber fall through the grate into a chamber underneath, from which they are forced through a "goose-neck" pipe into the second chamber, and finally the tailings are ejected from the compartment underneath the last emulsifying compartment. The cells are of rectangular shape, and the froth from each cell overflows on four sides into a common launder. The "Inspiration" flotation machine is divided into two compartments, each 24 ft. by 8 ft. 6 in. Each compartment is subdivided into eight sections, from each of which the froth overflows into a side-launder, the tailings passing under the dividing baffle-plate from one section to the next. Although considerable attention has been given recently to gravity flotation machines, the general success of this type is doubtful on account of insufficient agitation. When the froth is produced mechanically it carries a heavier charge of mineral than when produced by atomised air, and persists for a considerable time. The difference between the two froths apparently consists in the percentages of air and moisture, as compared with the amount of solids. Pneumatic aeration gives a slightly better separation on the finer slimes and requires less power and labour than mechanical machines.—C. A. K.

Estimation of mercury. Pifa de Rubies. See XXIII.

PATENTS.

Steel; Furnace for the heat-treatment of —
W. R. Bennett, Elmwood, Conn., U.S.A. Eng.
Pat. 118,598, 18.6.18. (Appl. 10,026/18.) Int.
Conv., 16.8.17.

THREE superimposed chambers, preferably of cylindrical shape, are heated by the products of combustion of fuel gas or oil, burning in a combustion chamber which forms the bottom section of the furnace. The hot gases travel through the two lower chambers, but the uppermost chamber, which is used for the final tempering of the metal, is heated only by heat conducted through the metal base of the section. A narrow space may be left between the second and third chambers, through which air may be drawn in order to regulate the temperature in the tempering chamber.—C. A. K.

Furnaces for annealing or heat-treating. W. N. Best, Brooklyn, N.Y. U.S. Pat. 1,281,480,
15.10.18. Appl., 14.6.18.

A CENTRAL furnace chamber has passageways on both sides, along which flames are delivered from two burners fixed at opposite ends. The passageways communicate with the furnace chamber by a series of ports in the dividing walls; the ports are graduated in size, the largest opening being adjacent to the burner mouth. The flue gases leave through openings in the bed of the furnace and are conducted through a central flue extending lengthwise under the furnace bottom.—C. A. K.

Malleable iron castings; Production of — F. Perry, and Industrial Inventions, Ltd., Tipton.
Eng. Pat. 121,074, 26.4.18. (Appl. 7049/18.)

THE metal casting is heated in a current of Mond, blast-furnace, or other gas, in which carbon dioxide, which is capable of removing carbon from iron, is associated with hydrogen, the latter preventing oxidation of the iron. The presence of

such a proportion of carbon monoxide as to prevent the reduction of the carbon dioxide at the working temperature, is preferred, and the gas should be purified from sulphur and hydrocarbons. "White-heart" castings are produced at a temperature between 800° C. and 950° C., a steady current of gas being passed until the desired degree of carburisation is effected; for "black-heart" castings a lower temperature (700° C.—800° C.) is preferred, with only sufficient gas to prevent the ingress of extraneous air or flue gas. The treated metal should be cooled in an atmosphere of the gas used. The sulphur content of iron is reduced if the annealing temperature is above 850° C.

—C. A. K.

Concentration of ores [by flotation]; Apparatus for the —. Minerals Separation, Ltd., Assignees of Minerals Separation and De Bavay's Processes Australia Proprietary, Ltd., Melbourne. Eng. Pat. 112,019, 4.12.17. (Appl. 17,973/17.) Int. Conv., 5.12.16.

In a modification of Eng. Pat. 10,666 of 1915 (this J., 1916, 930) the flow of pulp from one section of the flotation apparatus to a section at a lower level is controlled by an "equalising feed box," a constant level being maintained by means of an adjustable overflow plate. An inclined baffle is arranged in the separating chamber to divert the froth towards the higher exit. Air is admitted to the discharge pipes connecting the overflow outlet of one box with a box lower in the series by inlets in the pipe, in conjunction with an injector nozzle.—C. A. K.

Plating [tinning] sheet metal; Process and machine for —. C. C. Roberts, Ansonia, Conn., U.S.A. Eng. Pat. 112,125, 26.11.17. (Appl. 17,452/17.) Int. Conv., 16.12.16.

SHEET metal after being passed through cleaning rolls, and preferably between heating rolls, prior to entering the tinning bath, is drawn under a guide-shoe (or a rotary guide-drum) immersed in the molten coating metal. If it is required to coat the sheet on one side only, clamping collars operate on the edge of the sheet and prevent the liquid metal penetrating between the guide-shoe and the metal sheet. The concave face of the guide-shoe is heated by a burner in order to increase the temperature of that portion of the sheet metal in contact with the liquid coating metal.—C. A. K.

Welding; Method of electric —. T. E. Murray, jun., Brooklyn, N.Y. U.S. Pats. (A) 1,281,636 and (B) 1,281,637, 15.10.18. Appl., 6.2.18.

(A) Two different metals to be welded are subjected to a current of extremely high amperage for a very brief space of time, thereby producing molecular dissociation at each of the opposing faces of the bodies of metal "and an intermingling of the dissociated molecules, whereby said bodies are caused to form an integral body without solution of continuity, a part of said body being composed of a mixture or alloy of the materials of the two original bodies." (B) In electrically welding two bodies, with a contact area of which the length is greater than the width, the bodies are subjected to a high amperage current of brief duration, thus forming a body of a strength equal to that of an unwelded body of like material and dimensions; the amperage of the current is greater than that necessary to accomplish the same result in welding two bodies of identical material, when the length and width of the contact area are equal.—B. N.

Platinum and similar metals; Process for the extraction of — from their sands and ores. R. Thayer, Philadelphia, Pa. U.S. Pats. (A) 1,281,878 and (B) 1,281,879, 15.10.18. Appl., 5.3.18 and 1.9.17.

(A) For the recovery of platinum and allied metals from granular silicious ore, an alkaline solution is caused to diffuse through the mass, and the metal is "volatilised" by heating the wetted charge in a closed receptacle. (B) Heated chlorine gas is conducted through a mass of the metal-bearing sand, and the gas current is then passed through a solvent for the compound formed. The residue is leached to remove any unvolatilised compound of the metal, and the metal is subsequently recovered from the solutions obtained.

—C. A. K.

Alloy; Noble-metal —. G. H. Dufour, Oak Park, Ill., Assignor to Marshall Field and Co., Chicago. Ill. U.S. Pat. 1,282,055, 22.10.18. Appl., 15.4.18.

An alloy having a permanent appearance similar to that of platinum, is composed of about 74% of gold, 21.5% of palladium, and 4.5% of platinum.

—B. N.

Copper ores; Process of leaching —. A. W. Hahn, El Paso, Tex. U.S. Pat. 1,282,415, 22.10.18. Appl., 9.1.15.

An acid leaching solution is passed through a series of tanks containing ore until it becomes neutral, and is then passed through a fresh charge of ore, whereby ferric iron is precipitated. The solution thus freed from ferric iron is acidified, electrolysed, and returned to the tanks. The first tank of the series is cut out at intervals, and a tank with fresh ore added at the other end of the series.

—T. St.

Metals; Process of and apparatus for extracting — from ores. F. L. Antisell, Perth Amboy, N.J. U.S. Pat. 1,282,521, 22.10.18. Appl., 7.1.15.

METALLIFEROUS materials (e.g., copper ores) are leached with a solution saturated with the impurities present in the material but capable of dissolving the metal to be recovered. A portion of the solution saturated after contact with the ore is electrolysed, and the metal recovered, the electrolysed solution being transferred to the leaching system again, thus completing a cycle.—C. A. K.

Apparatus for precipitation. U.S. Pat. 1,281,443. See I.

Steel melting and other furnaces; Gas and air reversing valves for —. E. J. W. Richards, Glasgow, and W. Kane, Port Talbot. Eng. Pat. 121,316, 3.12.17. (Appl. 17,843/17.)

Copper ores; Treatment of —. A. A. Lockwood, Forest Hill. U.S. Pat. 1,282,892, 23.10.18. Appl., 20.1.17.

SEE Eng. Pat. 105,772 of 1916; this J., 1917, 654.

Zinc; Electrolytic recovery of —. G. H. Clevenger, Palo Alto, Cal., Assignor to H. W. Gepp, Melbourne, Victoria. U.S. Pat. 1,283,078, 20.10.18. Appl., 7.5.17.

SEE Eng. Pat. 115,847 of 1918; this J., 1918, 659 A.

Gold and silver; Obtainment of — from their ores. A. A. Lockwood, Forest Hill. U.S. Pat. 1,283,236, 20.10.18. Appl., 8.3.18.

SEE Eng. Pat. 112,876 of 1917; this J., 1918, 154 A.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Depolariser; Electric battery —. M. E. Holmes, Lakewood, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,281,372, 15.10.18. Appl., 21.2.18.

A DEPOLARISER for primary batteries is composed of molybdenum trioxide combined with a basic oxide, e.g., ammonium phosphomolybdate.—B. N.

[*Electric*] *battery fluids; Recovery of* —. S. H. Shelb, Assignor to H. and H. C. Froehling, Richmond, Va. U.S. Pat. 1,281,857, 15.10.18. Appl., 30.11.17.

THE used alkaline electrolyte of primary batteries is maintained quiescent in a drum until the oils have risen to the surface. The fluid is then run from the bottom of the drum into a receiver, and subjected to the action of an electric current to separate the zinc.—B. N.

Electric battery. R. W. Erwin, Fremont, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,282,057, 22.10.18. Appl., 30.11.15.

A NEGATIVE element, for a primary battery with alkaline electrolyte, is composed of a mixture of copper oxide and sulphur.—B. N.

[*Electric*] *furnace*. E. F. Collins, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,281,521, 15.10.18. Appl., 10.11.17.

THE furnace comprises a number of superimposed sections, each of which is composed of a wall of refractory material, within a metal casing, and inner and outer frameworks, the outer one supporting the furnace structure. The inner one is formed of tie rods, connected to annular metal end plates, and supports for electric heaters are attached to the tie rods, spaced from the inner wall of the furnace. The inner framework in each section is relatively movable with respect to the outer supporting framework, and the clearance space permits longitudinal adjustments due to the thermal expansion and contraction of the inner framework. The resistance heaters, mounted on the supports, are supplied with current by conductors passing through the wall.—B. N.

Electric furnaces; Mechanism for regulating the electrodes of —. V. F. Turner, Rotherham, and J. Walker, Sheffield. Eng. Pat. 121,409, 6.3.18. (Appl. 3883/18.)

Dehydrating emulsions. U.S. Pat. 1,281,952. See I.

Producing gas. U.S. Pat. 1,282,445. See IIa.

XII.—FATS; OILS; WAXES.

Glycerol residues from Reichert-Meissl determinations; Utilisation [recovery] of —. A. E. Parkes. Analyst, 1918, 43, 408–409.

THE residues in the distillation flask are collected, solid fatty acids are separated, the liquid is neutralised with solid calcium hydroxide, boiled, filtered, the filtrate concentrated to one-half of its volume, and 50% sodium hydroxide solution added to bring the alkalinity of the solution to the desired strength for subsequent use. Duplicate determinations with this recovered glycerol-sodium hydroxide and with fresh glycerol-sodium hydroxide gave identical results.—W. P. S.

Salmon oil. Bailey and Johnson. See XIXa.

PATENTS.

Catalyst [for hydrogenating oils]. A. Schwarzman, Assignor to Kellogg Products, Inc., Buffalo, N.Y. U.S. Pats. (A) 1,282,296 and (B) 1,282,297, 22.10.18. Appl., 7.5.18.

A CATALYST for hardening oils consists of (A) finely ground roasted quartz and fullers' earth or (B) poreless amorphous native silica of a fineness between 300- and 400-mesh (such as occurs in asbestos deposits), impregnated with finely divided reduced or colloidal nickel.—W. H. C.

Oily materials; Process of purifying —. Superior Oil and Process Co., and W. P. Schuck, Portland, Oreg., U.S.A. Eng. Pat. 120,820, 31.12.17. (Appl. 19,305/17.)

SEE U.S. Pat. 1,260,072 of 1918; this J., 1918, 312 A.

Soaps and cleansing agents for use in laundries. Escejay Co., Cincinnati, Ohio, Assignees of M. Spazier, Los Angeles, Cal., U.S.A. Eng. Pat. 113,086, 3.12.17. (Appl. 17,886/17.) Int. Conv., 27.1.17.

SEE U.S. Pats. 1,241,043 and 1,241,044 of 1917; this J., 1917, 1185.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Oil varnishes; Determination of volatile "thinners" in —. A. de Waele. Analyst, 1918, 43, 408.

THE use of a mixture of benzene, 3, and alcohol, 1 part, is recommended in place of the acetone employed for the removal of water in the steam distillation process described previously (this J., 1917, 603). Twenty c.c. of the benzene-alcohol mixture is sufficient to remove all the water from the most gummy residues.—W. P. S.

Guaiacum resin. Schroeter and others. See XX.

PATENTS.

Paint or varnish; Manufacture of — [from pitch]. F. W. Sperr, jun., Oakmont, and M. Darrin, Wilkesburg, Pa., U.S.A. Eng. Pat. 118,079, 14.12.17. (Appl. 18,619/17.) Int. Conv., 10.8.17.

A PAINT or varnish is obtained by dissolving hot coal-tar or water-gas-tar pitch in a suitable solvent containing compounds of the coumarone-indene group, e.g. "solvent naphtha." The coumarone-indene products may be polymerised before, simultaneously with, or after dissolving the pitch by blowing in steam or air at 160° C. or employing a suitable catalyst, e.g. aluminium chloride. Other paint materials such as thinners, pigments, driers, etc., may be added to the composition.—A. de W.

Printers' inks and colouring-matter and procedure whereby the same are producible. L. E. Barton, Niagara Falls, N.Y., and H. A. Gardner, Washington, D.C., Assignors to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,283,455, 5.11.18. Appl., 28.11.17.

A COLOURING matter suitable for printing-inks consists of pigment, organic colouring-matter, and titanic oxide coalesced with sulphate particles.—A. de W.

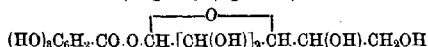
Paraphenylenediamine substance and process relating thereto. T. A. Edison, West Orange, N.J. U.S. Pat. 1,283,706, 5.11.18. Appl., 2.10.16.

p-PHENYLENEDIAMINE is added to the usual ingredients which react on heating to form a hardened phenolic condensation product.—A. de W.

XV.—LEATHER; BONE; HORN; GLUE.

Tannin and similar substances; Synthesis of —. V. B. Fischer and M. Bergmann. Ber., 1918, 51, 1760—1804.

PREVIOUS attempts to prepare pentadigalloylglucose (this J., 1912, 503, 1043; 1913, 500; 1915, 672) did not lead to the desired result owing to the unfavourable properties of the carbomethoxy-compounds. Recently, however, it has been found possible to prepare the penta-acetyl derivatives of *m*- and *p*-digallic acids and the corresponding chlorides in the crystalline state (Fischer, Bergmann, and Lipschitz, Ber., 1918, 51, 45); from these, the penta-(penta-acetyldigalloyl)-glucoses have now been prepared which, when hydrolysed by sodium acetate in aqueous acetone solution, yield the corresponding pentadigalloylglucoses. Penta-(*m*-digalloyl)- β -glucose is shown to be remarkably similar to Chinese tannin both in chemical and physical properties and in its specific rotation in organic media; the only point of difference noted is in the specific rotation in aqueous solution. Since, however, the solutions are colloidal in character and their optical activity is known to be greatly influenced by small factors, the authors do not consider the discrepancy to be necessarily fundamental. The chemistry of the pentagalloylglucoses has been further studied (compare Fischer and Freudenberg, this J., 1915, 672) and, through the triacetylgalloyl derivatives, it has now been found possible to isolate products which consist almost uniformly of the pentagalloyl derivatives of α - and β -glucose respectively. 2,3,5,6-Tetra-acetylglucose readily condenses with acyl chlorides in the presence of quinoline and, on subsequent removal of the acetyl groups, 1-acylglucoses are obtained, these being the first mono-acylglucoses to which a definite structure can be assigned. The reaction has been studied in the cases of benzoyl, acetylsalicyl, and, more particularly, triacetylgalloyl chlorides. From the 1-triacetylgalloyl-tetra-acetylglucose produced in the latter instance, 1-galloyl- β -glucose,



was obtained by cautious hydrolysis and proved to be identical in all respects with the glucogallin isolated by Gilson (Bull. Acad. roy. med. Belg., 1902, [4], 16, 827) from Chinese rhubarb. (See also J. Chem. Soc., Feb., 1919.)—H. W.

β -Glucosidogallic acid; Structure of —. E. Fischer and M. Bergmann. Ber., 1918, 51, 1804—1808.

THE work of Fischer and Strauss (this J., 1903, 99) has led to the supposition that β -glucosidogallic acid contains the sugar residue attached to the *p*-hydroxyl group of gallic acid; this hypothesis is now confirmed by its conversion into glucosyringic acid (Mauthner, J. prakt. Chem., 1910, 82, 271). The latter acid melts at about 225° C. (decomp.) when moderately rapidly heated and has $[\alpha]_D^{20} = -18.18^\circ$ (as sodium salt) in aqueous solution. (Compare J. Chem. Soc., Feb., 1919.)—H. W.

XVI.—SOILS; FERTILISERS.

Lime; Determination of the value of agricultural —. S. D. Conner. J. Ind. Eng. Chem., 1918, 10, 996—999.

RESULTS of pot-culture experiments showed that the value of agricultural lime was proportional to its acid-neutralising power, rather than to its content of calcium oxide, magnesium oxide, or carbon dioxide. The neutralising power is determined by boiling 1 gm. of the powdered sample with 6 c.c. of 4*N* hydrochloric acid and 75 c.c. of water, for 15 mins., and titrating the excess of acid with *N*/2 sodium hydroxide solution, using phenolphthalein as indicator. The results are expressed in terms of per cent. of calcium carbonate; some magnesites and dolomites show a calcium carbonate equivalent of over 100%.—W. P. S.

Potash [in fertilisers]; Sources of error incident to the Lindo-Gladding method for the determination of —. T. E. Keltt and H. E. Shiver. J. Ind. Eng. Chem., 1918, 10, 994—996.

IN the Lindo-Gladding method errors are introduced due to the bulk of the precipitate formed on addition of ammonia and ammonium oxalate, and to occlusion of potash in the precipitate; the two errors are partially compensating. The occluded potash cannot be extracted by washing the precipitate with hot water, but may be separated to a certain extent by dissolving the precipitate in hydrochloric acid, diluting the solution, and reprecipitating with ammonia and ammonium oxalate. Both iron and calcium phosphates, when precipitated with ammonia, occlude potash, and the occlusion is greater when the two are present together.—W. P. S.

Catalase and oxidase content of seeds in relation to their dormancy, age, vitality, and respiration. W. Crocker and G. T. Harrington. J. Agric. Res., 1918, 15, 137—174.

THE catalase activity of seeds may be measured by determining the volume of oxygen liberated from an excess of hydrogen peroxide solution, provided that the solution is first made neutral to phenolphthalein by the addition of *N*/10 sodium hydroxide. Various factors were found to affect the catalase activity of seeds. Thus, excessive pulverisation of the seeds, storing the powdered seeds in a desiccator, or drying seeds which had been in a germinator reduced their catalase activity. In the case of wheat the catalase activity of the embryo was found to be 28–29 times that of the endosperm, this relation being paralleled by the oxidase activity and respiration. Immature seeds of Johnson or Sudan grass showed a much greater catalase action than mature seeds, but the relative oxidase action differed with these two grasses. The physiologically inactive organs (sterile florets and caryopsis scales) showed only a small fraction of the catalase activity of the caryopses, whereas the oxidases were as active in the non-living as in the living organs. Retention in a germinator, not furnishing conditions suitable for germination, greatly reduced the catalase activity and the respiratory intensity of Johnson grass seeds, the effect on the oxidase activity being in the same direction but much less marked. In dry peach seeds the optimum temperature for after-ripening is apparently the optimum for catalase increase, whereas oxidase activity decreases with after-ripening, although autocolouration of the ground seed mass on exposure to air increases. During germination of grass seeds the catalase activity and respiratory intensity rise rapidly, but there is no rise in oxidase activity.

In certain seeds, such as those of Johnson grass, there is a close correlation between catalase activity and respiratory intensity but no correlation between these two factors and the vitality of the seeds or the vigour of the resulting seedlings. A general survey of the results indicates that no general conclusions can be drawn as to the catalase behaviour in all seeds, but it seems evident that seeds can be separated into several physiological types, for each of which more or less general conclusions can be drawn. Catalase activity of seeds seems to parallel physiological behaviour much more generally than does oxidase activity.—W. G.

Potash in Nebraska. Lliteras. See VII.

Waste water from sugar recovery. Skudrna. See XVII.

Effect of hydrocyanic acid on larva. Sasseer and Sanford. See XIXa.

PATENTS.

Phosphates; Treatment of — E. C. Soper, Chattanooga, Tenn., Assignor to Armour Fertilizer Works, Chicago, Ill. U.S. Pat. 1,281,681, 15.10.18. Appl., 19.12.13.

AN insoluble phosphate is converted into a citrate-soluble form by mixing it with water and an alkali salt to form a semi-fluid mass. This is made to flow in a thin layer on to a highly heated surface whereby it is quickly deprived of moisture and given a porous form. The porous material is calcined.—J. H. J.

Fertiliser; Process of making phospho-potassic — A. F. Delacourt, Assignor to Soc. Anon. Italiana Gio. Ansaldo and Co., Genoa, Italy. U.S. Pat. 1,282,385, 22.10.18. Appl., 5.6.18.

TRICALCIUM phosphate, a silicate rock containing potash, and free silica are heated together to 1000°–1100° C.—J. H. J.

Superphosphate; Process for disintegrating and storing — J. Lötjens and W. Ludewig, Hanover. Ger. Pat. 308,619, 15.2.17.

THE material coming from the reaction chamber is powdered by a movable disintegrating device, which is caused to travel while in operation, so that the ground phosphate is uniformly distributed in a thin layer over a large storage area. This layer cools rapidly, so that, if after 12–24 hours, another charge of powdered superphosphate is spread on the top of it, there is no danger of the first charge caking together.—J. F. B.

Stable manure and fluids; Process for increasing the fertiliser value of — A. Stutzer, Godesberg. Ger. Pat. 308,658, 25.12.17.

CALCIUM chloride, preferably in the form of a solution, is spread about in the stables, in the floor-channels and on the manure, in the proportion of about 25 parts of dry calcium chloride to 1000 of stable fluids. The ammonium carbonate which is formed by the decomposition of the urea is thereby converted into ammonium chloride and losses of volatile ammonia are avoided.—J. F. B.

Fertilisers; Manufacture of — Badische Anilin und Soda Fabrik. Ger. Pat. 308,659, 30.1.17.

UREA is mixed with superphosphates and at the same time or subsequently an earthy, sandy, or carbonaceous material is added. The finely

powdered mixture is thus preserved in a pulverulent condition suitable for spreading, owing to the absorption of excess moisture and the fixation of the acid.—J. F. B.

Calcium cyanamide. U.S. Pat. 1,282,381. See VII.

XVII.—SUGARS; STARCHES; GUMS.

Sugar; Seeding method of graining — H. E. Zitkowski. Amer. Inst. Chem. Eng., June, 1918. J. Ind. Eng. Chem., 1918, 10, 992–994.

THE method at present used for producing "granulated" crystals is as follows:—The syrup is concentrated *in vacuo* under the usual conditions until it is slightly supersaturated; at this point a quantity of sugar dust or powdered sugar, varying from 0.5 qt. to 2 qts. per 1000 cub. ft. of vacuum pan capacity, is introduced by aspiration. The syrup is then boiled vigorously for some minutes and the evaporation is continued until that density is reached usually obtained by the older methods of "graining." From this point the ordinary procedure is followed. The essential difference between the two methods is that in the older process the crystallising nuclei are formed by highly supersaturating the solution, whilst in the new process they are introduced ready made. The sugar powder used should pass a 100-mesh sieve.—W. P. S.

Raffinose; Influence of — on the determination of sucrose in beet molasses by different methods. [Determination of raffinose.] H. Pellet. Bull. Assoc. Chim. Sucr., 1917, 35, 16–30, 106–115. (See also this J., 1917, 155, 935.)

AFTER pointing out sources of error in earlier methods of determining raffinose, the author gives full working details of procedure for applying Hudson and Harding's method (this J., 1915, 1006) to beet molasses. A saccharimetric normal solution (2 or 3 litres) of the molasses is made, with sufficient basic lead acetate for clarification, and filtered. The lead is precipitated from an aliquot part of the filtrate by addition of a solution of sulphurous acid of sp. gr. 1.038–1.040; usually 10 c.c. per 100 c.c. of molasses solution is sufficient. The filtered liquid is completely neutralised with powdered calcium carbonate and again filtered. The liquid thus prepared may be subjected to the action of the two yeasts in various ways, but the author prefers to take eight portions of 100 c.c. each in eight separate flasks. Four of these, and an additional one containing only 100 c.c. of water, are treated each with 10 c.c. of top-fermentation yeast suspension, and the other four, besides an additional one containing 100 c.c. of water, are treated with 10 c.c. of bottom-fermentation yeast suspension. To prepare the top-fermentation yeast, 100 grms. of pressed bakers' yeast is ground in a mortar with 6.6 grms. of powdered sodium salicylate until it forms a homogeneous paste. This paste (which can be kept indefinitely), mixed with an equal volume of water, constitutes the suspension referred to above, and a similar one is prepared from bottom-fermentation beer yeast in the same way. After addition of 2 drops of glacial acetic acid to each of the ten flasks, these are closed and kept either at the ordinary temperature or in a bath at 55° C. To ascertain the rotations finally attained in presence of the top- and bottom-fermentation yeasts respectively, the four flasks of each series are withdrawn for polarisation, one by one, after successive periods of 2 hours or 24 hours, accord-

ing as the inversions are carried out at 55° C. or at the ordinary temperature. When the practical identity of two consecutive readings shows that the final rotation has been attained, the latter is corrected for the rotation of the corresponding yeast extract in the fifth flask. In polarising the contents of a flask, 50 c.c. of the liquid is treated with 1 c.c. of 30% normal lead acetate solution, made up to 100 c.c., shaken with 2 grms. of a mixture of decolorising charcoal and kieselguhr, and filtered, all readings being taken in a jacketed tube at the same temperature. With a polarimeter based on a normal weight of 26 grms., and a 200 mm. tube, a difference of 1° Ventzke between the final corrected rotations in presence of the top- and bottom-fermentation yeasts respectively indicates 0.351 gm. of anhydrous raffinose per 100 c.c. of the liquid. The method gave correct results with an artificial mixture of sucrose and raffinose; it indicated the presence of 0.8–1.5% of raffinose in samples of beet molasses, and the absence of raffinose in cane molasses. With raw beet sugars and beet molasses the method, usually but not invariably, gives higher results than that based on the Clerget process.—J. H. L.

Cane molasses; Composition of — H. Pellet. Bull. Assoc. Chim. Sucr., 1917, 35, 118–129.

A CRITICAL discussion of the data furnished by commonly employed methods of analysing cane molasses, and suggestions (largely based on the author's own work, see this J., 1901, 754; 1914, 35; 1917, 467) for greater accuracy and for a more complete analysis involving the separate return of sucrose, dextrose, levulose, glucose, and mannose. —J. H. L.

Molasses; Separation of sugar from — by the saccharate process. C. J. Leonis. Sugar, 1918, 20, 15–17, 56–57.

IN extracting the sugar remaining in the final molasses obtained in beet factories in the United States, it is the practice to dilute the product with wash-water to a suitable sucrose content, and add milk of lime at 35° Brix at the rate of 18 parts of calcium oxide per 100 of sucrose present, that is, sufficient to form the mono- and some disaccharate. To precipitate the insoluble trisaccharate, powdered lime is then gradually added in a cooler at 12°–13° C. (preferably under pressure), taking care not to allow the temperature to rise above 14° C.; the addition is stopped when the density of the filtered solution corresponds to 65° Brix. The liquor is passed into a filter-press; the cake is washed with water containing a little milk of lime, discharged from the presses, diluted with a little "sweet-water," and finally sent to the carbonators, where the saccharate is decomposed, the recovered sugar being united with that in the juice undergoing clarification.—J. P. O.

Waste water; Utilisation of the — resulting from the saccharate process of recovering sugar from molasses. A. W. Skudrna. Sugar, 1918, 20, 220–221.

WASTE water from the saccharate cake in the recovery of sugar from final beet molasses (see preceding abstract) contains about 0.5% of potash and 0.1% of nitrogen. Up to 1400 tons of this waste water may be produced daily, and it is now the custom at one of the Colorado factories to pump it during the campaign over the autumn-ploughed land, and to follow this application with a beet crop. Appreciable increases in the beet tonnage and other crop yields have resulted.—J. P. O.

Horse-chestnuts; Utilisation of — [for preparation of starch, etc.]. A. Heiduschka. Pharm. Zentralh., 1918, 59, 291–293.

MACERATION before or after fermentation, or after treatment with sodium carbonate solution, presented mechanical difficulties in the separation of starch from horse-chestnuts, but the following method was found to be practicable. The air-dried meal (containing about 91% of dry substance) is made into a paste with 1% sodium sulphite solution and, after an hour or so, the paste is mixed with water, and the starch washed through a fine sieve. The yield is about 40% of starch. The wash-water contains dextrans, dextrose, proteins, oils, etc., and may be utilised in the distillery, or mixed with the insoluble portion of the chestnuts, or with other foodstuffs, and used as a fodder.—W. P. S.

Tannin and similar substances. Fischer and Bergmann. See XV.

Fumaric acid fermentation. Wehmer. See XVIII.

Determining lactose. Hildt. See XIXa.

PATENTS.

[Sugar beet;] *Extraction of juice from vegetable substances* [—]. J. I. Thornycroft, Bembridge, Isle of Wight. Eng. Pat. 120,448, 12.11.17. (Appl. 10,587/17.)

AN apparatus for continuous counter-current diffusion, particularly adapted to beet sugar extraction, consists of a tall cylindrical jacketed diffuser, having a conical lower portion connected with a vertical feed cylinder of smaller diameter below it. Fresh beet slices are introduced into the feed cylinder through a lateral valve pipe, and a piston movable vertically in the cylinder forces them upwards into the diffuser through a lift valve which normally closes the top of the cylinder. The exhausted slices are discharged from the top of the diffuser, where also the water or fresh syrup enters. The walls of the diffuser at its lower end are perforated, to enable the saturated juice to escape into an annular casing whence it is discharged through valved pipes. A cylinder with piston, connected with these valved pipes, enables the juice to be forced back at intervals into the diffuser to clear the perforations of obstructing matters, and may also serve to introduce juice into the feed cylinder to displace any air therein before the contents of the cylinder are discharged into the diffuser. The diffuser may be provided at one or more points, at different heights, with inlets for water or juice, and these may be associated with means for circulating water or juice transversely through the material in the diffuser; e.g. two casings covering perforated openings on opposite sides of the diffuser may communicate externally through a rotary pump.—J. H. L.

Carbon; Process of manufacturing decolorising —. T. Hayashi, and Kwanto Sanso Kabushiki Kaisha, Tokyo, Japan. Eng. Pat. 121,035, 11.2.18. (Appl. 2445/18.)

SAWDUST, chaff, or other vegetable organic matter, finely chopped and disintegrated, is soaked with a large quantity of a solution of monocalcium phosphate and afterwards sprinkled with a solution of ammonia. The material is dried and carbonised by roasting in a reverberatory furnace or muffle oven, and the calcium pyrophosphate is dissolved out of the charcoal produced by steeping in a solution of phosphoric acid.—J. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Fumaric acid [; Production of — by] fermentation of sugar. C. Wehmer. Ber., 1918, 51, 1663—1668.

Aspergillus fumarius easily ferments relatively large quantities of sugar yielding fumaric acid and a little citric acid. Oxygen is necessary and, for continuous fermentation, calcium carbonate. Thus by the fermentation of 20 grms. of sugar (20% solution) by 287 grms. (dry weight) of *Aspergillus fumarius* in presence of calcium carbonate, 15 grms. of the latter is converted into about 33 grms. of calcium salts consisting chiefly of the sparingly soluble normal calcium fumarate but containing also varying quantities of the easily soluble acid fumarate, about 4% of calcium citrate, and the calcium salt of another, unidentified acid. The sugar is fermented completely and 60–70% of it is converted into acids. The optimum temperature for the growth of the organism is about 22° C. and the maximum about 30° C., but the formation of acid may take place above 30° C.—C. S.

Invertase solutions; Simple method of preparing very active —. H. Colin. Bull. Assoc. Chim. Sucr., 1917, 35, 84—88.

A suspension of yeast in water, e.g. 25 grms. in 150 c.c., is left to undergo putrefaction. The invertase activity of the liquid increases from day to day and attains its maximum when the reaction has become acid to litmus but neutral to methyl orange and *p*-nitrophenol. By filtering at this stage, in presence of kieselsol, a clear extract may be obtained which, if treated with toluene and shaken from time to time, will retain its activity for years. Bakers' yeast gives the palest and clearest extracts, though not the most active. Extracts prepared in this way will invert 20 times their volume of 5% sucrose solution in about an hour at 50° C., without themselves affecting the optical rotation of the liquid. They do not produce any alcohol.—J. H. L.

Sodium carbonate as antiseptic in the fermentation industries. Bettinger and Delavalle. Bull. Assoc. Chim. Sucr., 1917, 35, 135—139.

Sodium carbonate solutions are largely employed in distilleries for washing air used for rousing fermentations and stimulating the growth of saccharifying *Mucors*, where on account of the robust character of the organisms perfectly sterile air is not essential. Experiments described showed that the germicidal power of sodium carbonate, even in 15–20% solutions, is very feeble, spores of certain organisms surviving 10 days' contact with such solutions. For the sterilisation of air, therefore, sodium carbonate solution is scarcely more effective as a washing agent than water alone.

—J. H. L.

Corozo or vegetable ivory; Manufacture of alcohol from —. G. Mezzadrol. Boll. Chim. Farm., 1918, 57, 361—362.

The seeds of *Phytalephas macrocarpa*, *Palma dum*, and other plants, known as corozo or vegetable ivory, contain a large amount of mannocellulose, which, when boiled with dilute mineral acids, is hydrolysed, with the formation of mannose. This sugar is fermentable by the yeast of saké, but the fermentation is too slow for industrial conditions. Much better results were obtained by means of selected wild yeasts occurring on fruits from Perugia, the solutions of mannose derived from corozo being completely fermented by these. These yeasts also ferment sucrose, dextrose, and maltose. In practice the saccharification product,

which should contain about 25% of total solids, is nearly neutralised, the acidity being left at 0.1%, and is treated with 150 grms. of sodium phosphate and 50 to 100 grms. of ammonium sulphate per hl., and pitched with the yeast in the same way as in the fermentation of molasses. The fermentation proceeds regularly and is complete in 48 hours, and distillation of the fermented product yields 4 to 6% of pure alcohol. Each 100 kilos. of corozo, or of the waste from the factories where buttons are made from the vegetable ivory, yields from 10 to 15 litres of alcohol. The waste fragments from the Italian factories yield from 20 to 30% of mannose when hydrolysed with acids. Mould fungi of the type of *Mucor Rouzii* will also effect the decomposition of the mannocellulose of waste vegetable ivory, but a higher temperature and pressure and a longer time are required than when mineral acids are used.—C. A. M.

Utilising horse-chestnuts. Heiduschka. See XVII.

XIXa.—FOODS.

Flour; Determination of the moisture content of —. F. T. Shutt and P. J. Moloney. Trans. Roy. Soc. Canada, 1917-18, [iii], 14, 101—106.

The lower results obtained by heating flour to constant weight in an air oven at 100° C. as compared with those from drying in a vacuum oven at the same temperature are not due to oxidation of the flour but rather to incomplete drying. Drying flour for 5 hours at 100° C. in a vacuum possesses the following advantages over drying in an air oven at the same temperature to constant weight:—(1) It gives results nearer the absolute moisture content of the flour; (2) duplicate analyses show a closer agreement, and (3) the results are obtained in a much shorter drying period. (Compare this J., 1918, 263 r.)—J. F. S.

Milk; Hygienic control of —. A. Verda and A. Kirchensteins. Schweiz. Apoth.-Zeit., 1917, 55, 665—668, 677—681, 689—692, 705—708. Z. angew. Chem., 1918, 31, Ref., 348.

The Tromsdorf test is the only one which gives positive indications in the case of acute udder inflammation. The sediment from the centrifuges should always be examined microscopically and bacteriologically. The detection of a large number of leucocytes and phagocytes calls for an inspection in the stalls, followed by a bacteriological examination of the milk of the suspected cows. All cows set aside for the production of milk for infants and invalids must not only be injected with tuberculin, but the milk from each cow and, if necessary, from each individual teat should be tested biologically. It is essential that a maximum specification be fixed for the number of germs present both in special milk and ordinary milk. The microscopic examination of the centrifuge sediment affords an approximate estimation of the number of germs in the milk.—J. F. R.

Milk; Behaviour of various substances as preservatives of —. H. Mohorčič. Arch. Hyg., 1917, 86, 254. Chem.-Zeit., 1918, 42, Rep., 189.

Whilst the addition of sodium salicylate, sodium benzoate, benzoic acid, boric acid, borax, sodium carbonate, or formaldehyde retards the formation of acid in milk, so much acid is formed eventually that the milk curdles. Frequently, a higher acidity is necessary to curdle preserved milk than is required to curdle untreated milk.—W. P. S.

Lactose [in milk]; Determination of —. E. Hildt. *Comptes rend.*, 1918, 167, 756–759.

MILK samples, especially those preserved with bichromate, often contain their lactose partially hydrolysed. In such cases the sugar can be determined by cupric reduction after hydrolysis has been rendered complete, provided the reducing power of the hydrolytic products is known. The use of mineral acids for hydrolysis is liable to result in partial destruction of galactose. Good results have, however, been obtained with various sulphonic acids, including those described by Twitchell (this J., 1906, 251). At a concentration of 1%, benzene- or phenol-sulphonic acid, used in the form of sodium or barium salt in presence of an equivalent quantity of sulphuric acid, completely hydrolyses 0.5% solutions of lactose in 4 hours at 100° C., and longer heating produces no further change in reducing power. Lactose in milk serum, however, is hydrolysed more slowly than in pure solutions. The author found that 10 c.c. of "cupro-potassic" solution which, employed at ebullition, corresponded with 0.0495 grm. of invert sugar, corresponded also with 0.0708 grm. of lactose hydrate or 0.0506 grm. of lactose hydrolysed by the sulphonic acids mentioned above. Whilst the solid residue from decomposed milk (*lait altéré*), dried *in vacuo* at the ordinary temperature, corresponds in weight fairly well with the sum of the constituents of the milk determined separately, the residue dried at 100° C. weighs considerably less, owing to destruction of sugar at the higher temperature. This destruction is attributed to interaction of the sugar with proteolytic products formed in the decomposing milk (cp. Maillard, this J., 1912, 144). The interaction probably takes place in two stages, the first of which proceeds at the ordinary temperature and involves evolution of carbon dioxide but no darkening of colour. The second stage, which requires a higher temperature, results in loss of water and the formation of dark-coloured products.—J. H. L.

Butyrometers; Graduation of Gerber —. H. D. Richmond. *Analyst*, 1918, 43, 405–407.

THE author discusses a paper by Day and Grimes (this J., 1918, 278A) and points out certain slight differences between the figures recorded by them and those found by himself. The figure adopted by the standardising authorities (one division = 0.125 c.c.) is the mean of those found by the author and by Day and Grimes and is a satisfactory one for use in standardising Gerber butyrometers.

—W. P. S.

Chlorine in foods; Determination of — without incineration. A. Weitzel. *Arbeit. Kaiserl. Ges.-Amt*, 1917, 50, 397. *Chem.-Zeit.*, 1918, 42, Rep., 170.

THE substance, e.g., meat, bread, dog biscuits, etc., is finely divided and heated at 100° C. under a reflux condenser for 30 mins. with nitric acid (sp. gr. 1.15); water is then added and the mixture boiled for a further 15 mins.; after cooling, a measured excess of standardised silver nitrate solution is added, the mixture filtered, and the excess of silver titrated with thiocyanate solution in an aliquot portion of the filtrate. In the case of salted fish, the substance must be heated with 10% potassium hydroxide solution, the mixture then diluted to a definite volume, and a portion boiled for 30 mins. with the addition of nitric acid and an excess of silver nitrate solution, and the excess of silver titrated as described.—W. P. S.

Salmon oil; Determination of the hexabromide and iodine values of — as a means of identifying the species of canned salmon. H. S. Bailey and J. M. Johnson. *J. Ind. Eng. Chem.*, 1918, 10, 999–1001.

THE following results were obtained with oils from canned salmon of different species:—

—	Iodine value	Hexabromide value
Red, Sockeye or Blue-back (<i>Oncorhynchus nerka</i>)... ..	140.72–148.10	32.61–37.35
Chinook, King or Spring (<i>O. tshawytscha</i>) ...	126.62–134.48	23.86–31.06
Medinn Red, Coho or Silverside (<i>O. kisutch</i>)	152.51–166.40	43.07–50.31
Humpback or Pink (<i>O. gorbuscha</i>)... ..	153.58	40.17
Chum or Dog (<i>O. keta</i>)	133.10–147.75	27.59–35.53

From three to six samples of each kind were examined. The expressed oils had practically the same values as the oils extracted with ether. An acetic acid solution of bromine was used as the brominating agent in the determination of the hexabromide value.—W. P. S.

Kafirin; Hydrolysis of —. D. B. Jones and C. O. Johns. *J. Biol. Chem.*, 1918, 36, 323–334.

KAFIRIN, the alcohol-soluble protein of kafir, closely resembles the alcohol-soluble protein of maize, zein, in its composition. It contains large quantities of leucine and glutamic acid and is free from glycine. It differs from zein in containing a trace of tryptophan.—H. W. B.

Tyrosine in proteins; Determination of —. C. O. Johns and D. B. Jones. *J. Biol. Chem.*, 1918, 36, 319–322.

TYROSINE can be estimated in proteins after hydrolysis with hydrochloric acid by means of the colorimetric method of Folin and Denis (*J. Biol. Chem.*, 1912, 12, 245).—H. W. B.

Straw; Feeding experiments with digested —. G. Flingerling. *Landw. Versuchsstat.*, 1918, 92, 1–56. *Z. angew. Chem.*, 1918, 31, Ref., 347.

THE digestion of straw without pressure yields a fodder having a starch-value ranging between 45 and 75% of that of the dry, digested straw, according to the quantity of caustic soda used for the digestion and the manner of steaming. The small amount of protein in the digested straw is unassimilable, and this circumstance must be taken into account when making up the fodders. A good cooking effect can be obtained by the use of sodium sulphide or other reagents. Cooked straw is readily accepted and tolerated by the animals after they have become accustomed to it. The assimilation of completely digested straw (so-called straw pulp) by ruminants is not increased by grinding the pulp.

—J. F. B.

Wood cellulose as fodder in Sweden. C. G. Schwalbe. *Papier-Zeit.*, 1918, 43, 318. *Z. angew. Chem.*, 1918, 31, Ref., 347.

FEEDING trials have been made with wood cellulose, previously treated with small quantities of acid, in order to make it tender and destroy the felting capacity of the fibres. The experiments showed a very high digestibility but a tendency to give rise to kidney irritation. The unfavourable results may be explained by the various forms in which wood cellulose is prepared for fodder. The author points

out that if the chemical treatment is not carried out correctly, undesirable side reactions may occur, with the formation of small quantities of methyl alcohol, formaldehyde, formic acid, or acetic acid, which are not in themselves injurious to the cattle but yet may lower the digestibility of the fodder.

—J. F. B.

Utilising horse-chestnuts. Heiduschka. See XVII.

Yerba mate. Guglielmelli and Estrella. See XX.

PATENTS.

Margarine; Manufacture of —. H. Norton, Liverpool. Eng. Pat. 120,836, 28.2.18. (Appl. 3609/18.)

ABOUT 40 parts of edible oil and 10 parts of hard fat are heated together to the melting point of the fat and churned with about 2 parts of uncoagulated egg albumin dissolved in 8 parts of water heated to the same temperature as the fat but below the coagulation point of the albumin. The product is pressed to extract surplus water, and colouring and flavouring matters are added.—J. H. J.

"*Ripening*" or "*souring*" milk or cream for use in the manufacture of butter, margarine and the like; Tanks or containers for —. C. Revis and E. R. Bolton, London, and C. Downs and R. A. Bellwood, Kingston-upon-Hull. Eng. Pat. 121,033, 6.2.18. (Appl. 2123/18.)

THE milk to be soured is placed in a jacketed tank of tinned copper supplied with hot and cold water. In the tank is a series of pipes in parallel or in coils, the inlet and outlet being upright pipes bent over the upper edge of the ends of the tank. These upright pipes are carried in blocks which slide in perpendicular guides standing on the top of the tank. The blocks are connected to cranks worked from a shaft underneath the tank, which causes the series of pipes to be moved up and down in the tank; or, the raising and lowering may be done by a hydraulic ram arrangement. By these means the milk is kept in slow movement and each portion is brought successively to the surface for aeration. A current of brine may be passed through the pipes for cooling purposes. Covers are provided for the tank which can be raised and turned back mechanically.—J. H. J.

Milk and other liquids; Process and apparatus for preserving and sterilising —. A. F. Spencer, Margate. Eng. Pat. 120,963, 26.11.17. (Appl. 17,442/17.)

THE apparatus consists of two sterilising cylinders connected to one or more bottles for the sterilised liquid. Before use the whole apparatus is sterilised by passing heated air at 300° F. (about 150° C.) through it, and is then cooled. Milk is poured into one of the sterilising cylinders, which is maintained at 160° F. (about 70° C.) for 15 mins. by a gas jet, or by passing sterilised air cooled to 160° F. through it. During this period the milk is gently stirred by blades and is under a slight pressure from the air enclosed between the liquid level and the top of the cylinder. By this pressure the milk is transferred to the second sterilising cylinder, where the process is repeated. The milk is then passed through a cooler into the bottoms of the receiving bottles, which are closed at the top, until they are nearly full, when a tap on the entry pipe of each bottle is closed.—J. H. J.

Soya beans; Process of producing liquid food from —. A. B. Moses, Seattle, Wash. U.S. Pat. 1,281,411, 15.10.18. Appl., 27.12.17.

SOYA beans are disintegrated and allowed to stand with water until the nutritive matters are dissolved; then the mass is heated, and is afterwards cooled and strained. The residue is subjected to mechanical pressure and the expressed liquid is added to the strained liquid.—J. H. J.

Food product and process of making same. F. E. Pierson, Gravity, Iowa. U.S. Pat. 1,281,828, 15.10.18. Appl., 27.4.18.

CORN (maize), from which the hulls have been removed, is immersed in acetic acid, drained, and frozen. Afterwards, the moisture is evaporated from the corn.—J. H. J.

Bread; Method of treating —. H. J. Lueders, Assignor to F. Treuleben, Washington, D.C. U.S. Pat. 1,282,251, 22.10.18. Appl., 22.11.17.

BREAD, after baking, is cooled and is then sterilised by subjecting the crust to a temperature between 140° and 600° F. (60°–315° C.) in order to destroy moulds.—J. H. J.

Curing meats; Process of —. A. C. Legg, Birmingham, Ala., U.S.A. Eng. Pat. 120,964, 26.11.17. (Appl. 17,453/17.)

SEE U.S. Pat. 1,250,934 of 1917; this J., 1918, 164 A.

XIXB.—WATER PURIFICATION; SANITATION.

Water softening. P. E. King. J. Soc. Dyers and Col., 1918, 34, 240–243.

A REVIEW of processes of softening water is given. In the Gaillet and Huet, or Stanhope continuous process, clear saturated lime water is made by passing a definite proportion of the water to be treated through milk of lime at the bottom of a saturator, a clear saturated solution being discharged at the top. This is added to the hard water together with sodium carbonate solution, and the mixture passes up a clarifying tower with diaphragms fixed to alternate sides to remove the precipitated solids. Plants operating with saturated lime water are becoming obsolete, as 10–25% of the hard water has to be passed through the lime saturator. The Lassen and Hjort is an efficient method in which the water is measured by a tipper in the treatment tank, the tipping action also regulating the addition of milk of lime and sodium carbonate. The precipitated solids settle out and the effluent is passed through a wood wool filter. In the Paterson "Osilameter Bye-pass" method a proportion of the water is by-passed through a tipper; the main stream of water drives a water-wheel which works agitators in the chemical tank; the agitators are provided with cups which fill the reagent measuring bucket which is overturned by the action of the tipper. The Archbutt and Deeley process is discontinuous and the softened water is carbonated to neutralise alkalinity and prevent subsequent deposition. In the Permutit process there is no precipitate produced and the water is reduced to zero hardness. When this process is used after a lime-soda process, certain disadvantages are found to occur, in that free lime passing through permutite produces caustic soda, which gradually dissolves the material. Moreover, sodium carbonate in passing through permutite containing calcium-permutite, produces calcium carbonate which turns the softened water opalescent. Fre-

alkali in softened water always causes a subsequent deposition of calcium carbonate, a process hastened by contact with permittite, which thus becomes contaminated with calcium carbonate and ultimately inactive.—J. H. J.

Water softening [in the textile industry]. E. V. Chambers. J. Soc. Dyers and Col., 1918, 34, 243–246.

A REVIEW is given of the plant used in water softening processes in the textile industry. Continuous processes of softening have received more attention than intermittent processes, mainly because the plant occupies less room and requires less attention. In the intermittent system, working on a four hours' cycle, a plant to deal with 5000 galls. of water per hr. requires a total tank capacity of 40,000 galls.; whereas in the continuous system the corresponding tank capacity is only 15,000 galls. In a good continuous plant a total hardness of 26° can be reduced to 2.5°, without imparting any appreciable alkalinity to the treated water, at a cost of about 2½d. per 1000 galls. In the textile districts, the rivers usually have a hardness of about 10°, and this can be dealt with satisfactorily by one of the lime-soda processes. The oil and suspended matter in the river water are carried down along with the precipitate produced, or can be deposited by the simultaneous addition of a little crude aluminium sulphate. A good deal of the water used in the textile industries can be used over again if properly purified. Waste water from piece-scouring processes is passed through a screen to remove fibre and then treated with sufficient sulphuric acid to decompose soap and separate grease. The fatty acids and grease are retained on filters. The water is then neutralised with sodium carbonate and stored for re-use. It has a total hardness of 4.5° and is clear and colourless. The cost is 2d. per 1000 galls.—J. H. J.

Hydrocyanic acid gas; Effect of — under vacuum conditions on subterranean larvæ. E. R. Sasscer and H. L. Sanford. J. Agric. Res., 1918, 15, 133–139.

THE effectiveness of hydrogen cyanide vapour under the conditions of the vacuum process in destroying subterranean larvæ, e.g. in the balls of earth enclosing the roots of imported nursery plants, is influenced by the water content of the soil. Vacuum fumigation with hydrogen cyanide at a concentration exceeding the equivalent of 1 oz. of sodium cyanide per 100 cub. ft. of space with an exposure of 1½ hours is not recommended for plants in foliage, and as all larvæ in soaked soil were not killed with concentrations of sodium cyanide varying from ¼–3 oz. per 100 cub. ft., fumigation of imported nursery stock at the port of entry with a dose which will not injure the plants is not an effective preventive against the introduction and establishment of subterranean pests. Apart from the tests with soaked soil, the best results were obtained when the plants were exposed to the gas first at a vacuum of 15 in., and then for 1½ hours under normal atmospheric conditions.—W. G.

PATENTS.

Filters [for water]. J. Wilson, London. Eng. Pat. 120,867, 9.8.18. (Appl. 12,966/18.)

A FILTER designed for upward filtration is provided with a dome with serrated edges in the space beneath the filtering medium, the top of the dome being connected with the top of the tank by a tube. The water to be filtered is led into the dome and passes through the serrations, while any air escapes by the tube in the top of the dome. After passing

through the filtering medium, the water leaves the filter by a pipe near the top. In cleaning the filter, a valve in a wide pipe in the bottom of the filter under the dome is opened, which causes the water standing in the filter to pass through the medium as a flush. More water is then admitted to the space beneath the material and allowed to fill the filter. The valve beneath the dome is opened again and the filter allowed to become only partly empty, while at the same time air is drawn into the space beneath the medium through a special pipe. More water is again admitted to the space beneath the medium, which causes the imprisoned air to be driven out through the medium, thus agitating it.

—J. H. J.

Water and other liquids; Apparatus for purifying —. J. Wilson, London. Eng. Pat. 121,180, 5.12.17. (Appl. 18,044/17.) Addition to Eng. Pat. 7029, 21.3.11.

AN improved apparatus is described for carrying out the process of purifying water described in a previous patent (this J., 1912, 200), in which milk of lime is added to the water by means of cups. The improvement consists in using two oscillating buckets, one of which actuates the cups for adding the reagent, whilst the other actuates the stirrer for the reagent. Means are provided for reducing the supply of water to the latter bucket when the flow through the apparatus increases above a determined volume.—J. H. J.

Air-diffusing apparatus. C. H. Nordell, Milwaukee, Wis. U.S. Pat. 1,281,816, 15.10.18. Appl., 12.5.17.

A PORTION of the tank containing the liquid to be aerated is recessed, the recess having a concave bottom, and an arch of the same curvature as the bottom, made of diffusing blocks, placed edge to edge, is supported a little away above the bottom. The air is admitted between the bottom and the blocks.—J. H. J.

Antiseptics, disinfectants and the like [zinc tribromophenolate]. B. Abrahamsen, Trondhjem, Norway. Eng. Pat. 117,072, 4.6.18. (Appl. 9207/18.) Int. Conv., 28.6.17.

A DISINFECTANT for wounds is claimed, consisting of the zinc salt of tribromophenol with or without zinc hydroxide, prepared by precipitating a neutral or alkaline solution of a soluble salt of tribromophenol with a soluble zinc salt. It has not the cauterising action of tribromophenol itself, and is better adapted than the bismuth salt ("Xeroform") to the preparation of antiseptic gauze, as it forms a gelatinous mass with alcohol.—J. H. L.

Disinfectant; Solidified soluble coal-tar-derivative —. A. Franck-Phillipson, Chicago, Ill. U.S. Pat. 1,282,062, 22.10.18. Appl., 15.3.18.

TAR oil is mixed with fat and with sufficient alkali to neutralise the free acids of the tar oil and saponify or partly saponify the fat. The mass is solidified, and is capable of producing a stable emulsion with water.—J. H. J.

Softening and purifying water, metering fluids, or the like; Apparatus for —. G. J. Gibbs, Preston. Eng. Pat. 120,752, 27.10.17. (Appl. 15,663/17.)

Water or sewage; Apparatus for purifying —. C. E. Wallace, Tompkinsville, and M. F. Tiernan, New York, U.S. Pat. 1,283,993, 5.11.18. Appl., 26.3.15.

See Eng. Pat. 113,105 of 1916; this J., 1918, 191 A.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Morphine in complex products; Determination of —. II. Mixtures containing morphine as a simple salt. A. Tingle. Amer. J. Pharm., 1918, 90, 788—795. (See this J., 1919, 27 A.)

To determine morphine in pills, powders, etc., 6 grms. of the sample is mixed with 2 grms. of calcium carbonate and 20 c.c. of water and warmed until a uniform paste is obtained; 60 c.c. of cold saturated barium hydroxide solution is then added, and, after 30 mins., the mixture is filtered. (The insoluble portion should be dissolved in hydrochloric acid, warmed, filtered, and the filtrate tested for meconic acid with ferric chloride; the presence of meconic acid indicates that the morphine is in the form of opium, in which case the method is not applicable.) Fifty c.c. of the filtrate is treated, drop by drop, with dilute sulphuric acid, to precipitate the barium, then diluted to 55 c.c., and filtered. Fifty c.c. of the filtrate is rendered just alkaline (to litmus paper) with sodium hydroxide solution, then acidified slightly with hydrochloric acid, and evaporated to a volume of not more than 5 c.c.; this residual liquid is transferred to a separating funnel with about 10 c.c. of water, 25 c.c. of a mixture of chloroform and alcohol (2:1) is added, followed by a quantity of saturated sodium bicarbonate sufficient to render the mixture just alkaline. After shaking, the chloroform layer is drawn off, and the extraction repeated four times. The united chloroform extracts are evaporated, and the residue titrated with N/10 sulphuric acid, using lacmoid or cochineal as indicator. Each c.c. of N/10 acid is equivalent to 0.0300 gm. of morphine.

—W. P. S.

Quinine; Detection of —. H. Salomon. Ber. deuts. pharm. Ges., 1918, 28, 273—275.

The fluorescence produced when a quinine solution is treated with dilute sulphuric acid is a very sensitive test and will detect 1 part of the alkaloid in 100,000 parts of solution. A less sensitive test (1 in 10,000) consists in treating the quinine with chlorine and then with ammonia, a green coloration being produced (thalleloquin reaction). It is recommended that bromine be used in place of chlorine in this test; the bromine-water must be added cautiously until the solution is just coloured yellow and a drop of ammonia then introduced. Another reagent for quinine recommended by Giemsa and Halberkann (Deuts. Med. Wochenschr., 1917, Nr. 48) consists of potassium iodide 10, mercuric chloride 2.7, water 200, and glacial acetic acid 25 grms.; this gives a turbidity with a solution containing 1 part of quinine in 200,000 parts. To detect quinine in urine, the alkaloid should first be extracted with ether.—W. P. S.

Alkaloids of the betel nut. K. Freudenberg. Ber., 1918, 51, 1668—1682.

The author shows by direct comparison and in other ways that guvacine is 1.2.5.6-tetrahydropyridine-3-carboxylic acid (Freudenberg, this J., 1918, 560 A) and not 1.2.5.6-tetrahydropyridine-4-carboxylic acid (Hess and Leibbrandt, this J., 1918, 559 A; see also J. Chem. Soc., Feb., 1919).—C. S.

Digitalis leaves of different origin; Active glucosides of —. E. Meyer. Arch. exp. Path. u. Pharm., 1917, 81, 261. Chem.-Zeit., 1918, 42, Rep., 190.

First and second year digitalis (*D. purpurea*) leaves contain the same amount of glucosides, and the latter cannot be extracted from the leaves with the use of less water than twenty-five times the weight

of the leaves. The concentration of active glucosides (gitalin and digitalein) in the aqueous extract is never greater than 1 to 3020. The active glucosides cannot be extracted directly from the leaves by means of chloroform, since the gitalin is present in a form insoluble in this solvent; gitalin may also become insoluble in chloroform when the aqueous extract is dried. The following process may be used for concentrating the active principles:—20 c.c. of the cold water extract is concentrated *in vacuo* over sulphuric acid to a volume of 3 c.c., the residue is treated with dry sodium carbonate, and shaken with 50 c.c. of chloroform: anhydrous sodium sulphate is then added in quantity sufficient to combine with all the water present. The chloroform solution is separated, the residue washed with chloroform, the united extracts evaporated *in vacuo* at 30° C., and the residue then treated with a small quantity of water and again heated at 30° C. *in vacuo* to remove the last traces of chloroform.—W. P. S.

Digitalis substances. XXXVIII. H. Kiliani. Ber., 1918, 51, 1613—1639.

A RECORD of some neutral and acid substances obtained by the oxidation or reduction of digitogenic acid, gitogenic acid, digitoxigenin, and digitaligenin. The sugar syrup previously obtained (this J., 1916, 615) could not be made to crystallise because the sugars in the syrup, which had been prepared in an alcoholic medium, were present chiefly in the form of ethylglucosides. After a second hydrolysis with hydrochloric acid a partial crystallisation was effected and *d*-galactose obtained by inoculation; dextrose, identified as *d*-gluconic acid, and apparently a third sugar, a ketose, were also present. (See also J. Chem. Soc., Feb., 1919.)

—C. S.

Yerba mate; Testing the purity of —. L. Gugliamelli and C. G. Estrella. Anal. Soc. Quím. Argentina, 1918, 6, 136—150.

The method proposed by Sabatini (this J., 1918, 221 A) is based on the reduction of ferric chloride by the caffeine contained in the mate. The authors show that discordant results are obtained with the same sample of mate owing to the different degrees of hydrolysis of the ferric chloride solutions used. Their experiments show further that in the conditions specified caffeine exerts no reducing action on ferric chloride and that in any case there is a reaction between the ferric salt and such substances as resorcinol, catechol, etc., which are also present in the mate.—W. S. M.

Pyrimidone (dimethylaminoantipyrine); New and delicate reaction of — and its differentiation from antipyrine. L. P. J. Palet. Anal. Soc. Quím. Argentina, 1918, 6, 151—155.

The author finds that an acid solution of pyrimidone treated with a few drops of an acid solution of potassium ferricyanide and ferric chloride gives an intense blue coloration and precipitate of Prussian blue. The test is very delicate. With antipyrine a blood-red colour is obtained with the same reagent. This colour is converted into a pale yellow by the addition of a few drops of hydrochloric acid. The test is therefore carried out in hydrochloric acid solution, which permits the blue due to the presence of pyrimidone in a mixture to emerge. In this way 0.01 part of pyrimidone may be detected in one part of antipyrine. Phenacetin, acetanilide, acetylsalicylic acid, exalgin (methylacetanilide), and caffeine give no reaction with the reagent.

—W. S. M.

Alkaloids, glucosides, and other vegetable principles; Reaction of the "ferri-ferric" reagent with —. L. P. J. Palet. Anal. Soc. Quim. Argentina, 1918, 6, 156—158.

AN extension of the application of a mixed solution of potassium ferricyanide and ferric chloride (see preceding abstract) to the characterisation of alkaloids, glucosides, and other substances of vegetable origin. Of 102 substances of this kind tested, 42 gave a positive reaction, i.e., a more or less intense blue coloration.—W. S. M.

Enzymic reagents; Use of —. II. Detection of pyrimidone and the differentiation of the naphthols. L. P. J. Palet. Anal. Soc. Quim. Argentina, 1918, 6, 250—257.

IF some small pieces of the root of alfalfa, which contains oxidases and peroxidases, be added to a solution of pyrimidone, a violet-blue colour is produced on the root fibres on standing. The addition of hydrogen peroxide accelerates the appearance of, but does not intensify, the colour. The further addition of α -naphthol immediately produces an intense wine-red colour characteristically different from that produced by β -naphthol. This constitutes a delicate test for the presence of small quantities of α -naphthol in β -naphthol.—W. S. M.

Gualacum resin; Constitution of substances from —. G. Schroeter, L. Lichtenstadt, and D. Irineu. Ber., 1918, 51, 1587—1613.

AMONG the products obtained by the dry distillation of gualacum resin are two substances of unknown constitution, pyrogualacin and gualene. The latter is now proved to be 2,3-dimethylnaphthalene by its synthesis. Pyrogualacin is almost certainly ϵ -hydroxy-7-methoxy-2,3-dimethylnaphthalene. Gualaretic acid, extracted from gualacum resin by ether, has the formula $C_{20}H_{12}O_4$, not $C_{20}H_{12}O_5$ as stated by Herzig and Schiff (this J., 1898, 267, 600). It is optically active, $[\alpha]_D = -94^\circ$ in alcohol, and unsaturated. Herzig and Schiff's norgualaretic acid is proved to be norgualaretic acid. Hydrogualaretic acid methyl ether is most probably α -diveratryl- β -dimethylbutane, $[CH(CH_3)_2]_2CH_2 \cdot C_2H_5(OCH_3)_2$, and gualaretic acid methyl ether has the formula $C_{20}H_{12}(OCH_3)_2 \cdot CH : C(CH_3)_2 \cdot CH(CH_3)_2 \cdot CH_2 \cdot C_2H_5(OCH_3)_2$. The synthesis of 1,2-dimethylnaphthalene, b.pt. 139° — 140° C. at 15 mm., is described. (See also J. Chem. Soc., Feb., 1919.)—C. S.

Saccharin tablets; Examination of —. H. D. Richmond, S. Royce, and C. A. Hill. Analyst, 1918, 43, 402—404.

A MODIFICATION of a method described previously (this J., 1918, 246 r) is recommended since the presence of theobroma emulsion or similar substance containing soap causes excessive frothing when the tablets are boiled with alkali solution. The alkalinity of the tablets is determined by boiling one tablet with an excess of $N/10$ sulphuric acid and titrating the excess of acid with $N/10$ sodium hydroxide solution, using phenolphthalein as indicator. Let the alkalinity equal x c.c. of $N/10$ acid. Twenty tablets are then weighed, treated with 25 c.c. plus x c.c. of $4N$ sulphuric acid, the mixture diluted to 50 c.c., and boiled under a reflux condenser for 1.5 hr.; 20 c.c. of $7.5N$ sodium hydroxide solution is added together with a little powdered pumice, the ammonia is distilled into 20 c.c. of $N/5$ acid, and the excess of acid then titrated, using methyl-red as indicator. The result is calculated as percentage of α -benzoylsulphonimide by multiplying by 1.531. If the tablets do not dissolve completely in water, the insoluble portion should be collected on a filter and ignited; it will probably be talc.—W. P. S.

Uramino-acids; Method for the identification of certain — in the presence of amino-acids and of urea. A. Rohde. J. Biol. Chem., 1918, 36, 467—474.

THE urea is first destroyed by urease and the uramino-acid then extracted from the acidified solution by ethyl acetate. It is shown that amino-acids are not excreted from the body in conjugation with urea, as has been previously suggested, but in the free state. (See further J. Chem. Soc., Feb., 1919.)—H. W. B.

Arsenotungstic and arsenotungstomolybdic complexes as reagents for phenolic amines. L. Guglielmelli. Anal. Soc. Quim. Argentina, 1918, 6, 185—195.

REAGENTS prepared by boiling solutions of sodium tungstate with arsenic acid, and a mixture of sodium tungstate and molybdate with arsenic acid, until concentrated hydrochloric acid no longer produces a precipitate, have been shown to give a delicate colour reaction with phenols and some purine derivatives. The same reaction, i.e., an intense blue colour, is given by phenolic amines. The author has investigated a large number of substances of this class, also nitro-, sulphonic, and hydroxy-derivatives of these. Positive results were given with the first reagent with hydroxylamine and hydrazine and their derivatives of the types, $RNH-NH_2$, $NHR-NHR$, $NHR-OH$, and also with compounds containing the same groups separated from each other but united directly to a benzene, naphthalene, purine, or pyrazolone nucleus. The second reagent reacts with substances containing the same groups and in addition with substances containing one NH_2 group, e.g., aniline.—W. S. M.

Chloroform; Detection of hydrogen chloride in —. D. Vorländer. Ber. deuts. Pharm. Ges., 1918, 28, 385—388.

TEN c.c. of the chloroform is treated with a minute particle (about 0.01 mgrm.) of p -dimethylaminoazobenzene; if free hydrogen chloride is present a violet-red coloration is obtained, otherwise the solution remains yellow. An excess of the indicator must be avoided, since the yellow colour may mask a feeble coloration given by a mere trace of the acid. In doubtful cases, it is advisable to treat a further quantity of the chloroform with a few drops of the first portion containing the indicator. This method is more sensitive and reliable than the usual way of testing chloroform by shaking with water and then testing with litmus, as there is risk of gradual decomposition of the chloroform in presence of water. Carbon dioxide and anhydrous formic and acetic acids do not give a red coloration with p -dimethylaminoazobenzene in chloroform solution.—W. P. S.

Oil of cassia; Constituents of —. F. D. Dodge. J. Ind. Eng. Chem., 1918, 10, 1005—1006.

INCLUDING constituents known previously (see this J., 1916, 139) oil of cassia is now found to contain:—cinnamaldehyde (75 to 90%), cinnamyl acetate, phenyl propylacetate (?), methyl α -coumaraldehyde, salicylaldehyde (0.1 to 0.2%), coumarin, benzoic acid, salicylic acid, an unidentified liquid acid, benzaldehyde, and methylsalicylaldehyde. (See also J. Chem. Soc., Feb., 1919.)—W. P. S.

Carvacrol; Study of the conditions essential for the commercial manufacture of —. A. W. Hickson and R. H. McKee. J. Ind. Eng. Chem., 1918, 10, 982—992.

A PROCESS for the manufacture of carvacrol from cymene is described in detail; spruce turpentine is

used as the source of the cymene. Cymenesulphonic acid is made by agitating spruce turpentine with its own volume of sulphuric acid (66° B., sp. gr. 1.84) for 4 hrs. at 90° to 100° C. in a cast-iron vessel. The excess of acid is then neutralised by addition of ground limestone, and calcium sulphate is removed by filtration. The filtrate is treated with soda ash and the resulting sodium cymenesulphonate solution, after removal of the calcium carbonate, is concentrated and dried in a vacuum evaporator. The dry sodium cymenesulphonate is mixed with one-half of its weight of 76% sodium hydroxide and fused for 6 hrs. at 350°–370° C. in a cast-iron vessel provided with a cover and water-cooled condenser. The fused mass is then poured into a minimum quantity of cold water, the solution neutralised with sulphuric acid (40° B., sp. gr. 1.384), and the liberated carvacrol separated from the liquid by steam distillation or extraction with benzene; in the latter case the benzene is recovered by distillation. The carvacrol is re-distilled; it is a clear yellowish oil, b. pt. 232° C. The total cost, based on a 60% yield, is estimated to be about 60 cents per lb.—W. P. S.

Tannin and similar substances. Fischer and Bergmann. See XV.

β-Glucosidogallic acid. Fischer and Bergmann. See XV.

Fumaric acid fermentation. Wehmer. See XVIII.

Potassium in blood. Clausen. See XXIII.

Estimation of mercury. Piña de Rubies. See XXIII.

PATENTS.

Acetic anhydride; Process of making —. H. Dreyfus, Basle, Switzerland. U.S. Pat. 1,283,115, 29.10.18. Appl., 18.1.16.

See Eng. Pat. 17,920 of 1915; this J., 1917, 162. The sulphuric anhydride may be replaced by a mixture of sulphuric acid and anhydride containing 50–70% of free anhydride.

Phthaleins and similar compounds; Manufacture of mercury derivatives of —. Saccharin-Fabr. Akt.-Ges. vorm. Fahlberg, List, und Co., Magdeburg. Ger. Pat. 308,335, 28.11.14.

By heating neutral solutions of alkali salts of phthaleins, succineins, saccharins, etc. with a large excess of a mercury salt (mercuric chloride), readily filtered, crystalline mercury compounds may be obtained which can be washed free of mercuric chloride with hot water and are not readily decomposed, even with hot ammonium sulphide. Fluorescein may be removed from the products by washing with alcohol or acetone. Bromo- and iodo-derivatives of phthaleins are readily converted into mercury compounds by this method.—L. A. C.

Calcium halides and starch; Dry preparations containing —. E. Ritsert, Frankfurt. Ger. Pat. 308,616, 16.9.15.

APPROXIMATELY equal weights of calcium halide and starch are mixed at the ordinary temperature with sufficient water to form a paste which sets to a solid without the application of heat.—L. A. C.

Antiseptics. Eng. Pat. 117,072. See XIXb.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Mordant dye process; A new photographic —. F. E. Ives. Communication from Hess-Ives Laboratories. Brit. J. Phot., 1919, 66, Col. Suppl., 1.

An ordinary silver image is treated in a mixed potassium ferricyanide-chromic acid solution, a convenient strength being one part of each compound to 100 parts of water. This converts the silver image to a transparent yellow image, which is a silver salt containing also chromium but the exact composition of which has not yet been determined. The plate is then washed to remove all excess of chromic acid; the washing process is shortened, and the subsequent staining improved if a weak solution of sodium bicarbonate is used, but excessive treatment in this bath weakens the image. This transparent silver image acts more powerfully than previously described mordanting images such as the transparent silver iodide of Traube or the copper ferrocyanide image of Ives and Crabtree, suitable dyes being Safranin, Malachite Green, and Auramine. In a short historical introduction to the paper it is noted that the priority for the copper mordanting process described in the author's Eng. Pat. 113,617 of 1918 (this J., 1918, 607 A) belongs to Crabtree (see Brit. J. Phot., 1918, 357–359).

—B. V. S.

PATENT.

Celluloid or like material; Coating films of — with sensitised photographic emulsion. N. L. Scott, Ashtead, Surrey. Eng. Pat. 121,054, 19.3.18. (Appl. 4917/18.)

In the coating of celluloid film any unevenness in its surface during coating or setting, such as that produced by buckling, causes unevenness in the thickness of the coating even if this has been initially quite uniform, by running of the emulsion from the ridges to the hollows. This is prevented by damping the back of the film and then pressing it by means of a spring roller into close contact with the surface of a large smooth revolving drum on which it remains during coating and setting, contact being maintained by atmospheric pressure. The revolving drum is chilled internally to produce quick setting.—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

Cellulose; Nitration of — and determination of nitrogen in guncotton. A. Hervé. Monit. Scient., 1918, 62, 241–245.

COMPARATIVE nitrations of cotton showed definitely that as the percentage of water in the nitrating mixture was increased, the percentage of nitrogen in the pyroxylin decreased. On the other hand, a variation in the percentage of nitric acid in the nitrating mixture, within fairly wide limits, had very little influence on the percentage of nitrogen in the product and the effect was not regular. On comparing the composition of the baths before and after nitration, it was found that the quantity of nitric acid removed was always slightly greater than the equivalent of the percentage fixed in the nitrocellulose. It is concluded that, although in the manufacture of soluble pyroxylin the effect of small variations in the percentage of nitrogen is not of vital importance, in the manufacture of guncotton such variations have a very considerable influence on the ballistic power, and the control of the percentage of water in the nitrating mixture requires the most urgent attention. The regeneration of old

nitrating baths by the addition of sulphuric and nitric acids is performed on the basis of analyses of samples taken from large reservoirs in which the acids are mixed by the agitation of compressed air. Analyses have shown, however, that homogeneity in composition is not always easily obtained by this method of mixing, even when agitation is prolonged for several hours, and substantial variations have been found in the percentage of nitrogen in the nitrated cotton produced with acid taken from different parts of the tank. The author has made a careful examination of Crum's method for the determination of nitrogen in nitrocelluloses, using the Lunge nitrometer. To obtain consistent results it is absolutely necessary to verify that the reaction with the mercury has been complete, by shaking again after the volume has been accurately read off. Generally, two vigorous shakings are sufficient, and there is no alteration in volume after a third, but if a change is noted the operation must be repeated until the result is constant. One of the principal causes of divergent results is inattention to the solubility of nitric oxide in sulphuric acid. This gas is only insoluble in sulphuric acid of 85% concentration; its solubility in stronger acid becomes very sensible and reaches 0.035 c.c. per c.c. of acid in the case of 94% sulphuric acid. It is possible to arrange matters so that the acid in the tube, after dissolving the nitrocellulose in 96% acid, has a final concentration of 85%.—J. F. B.

Estimation of mercury. Piña de Rubies. *See* XXIII.

PATENTS.

Explosive. P. E. Haynes and H. E. Thompson, Buffalo, N.Y., Assignors to The Linde Air Products Co., Cleveland, Ohio. U.S. Pat. 1,282,229, 22.10.18. Appl., 8.3.18.

The explosive contains carbonised balsa wood and liquid ozone.—T. St.

Explosive. C. E. Griffing, Assignor to W. H. Kennedy, Los Angeles, Cal. U.S. Pat. 1,282,413, 22.10.18. Appl., 31.5.17. Renewed 18.3.18.

The explosive consists of powdered potassium chlorate 50, white granulated sugar 49, potassium permanganate 0.33, powdered white sulphur 0.33, and talcum powder 0.33%.—T. St.

XXIII.—ANALYSIS.

Permanganate solutions; Arsenite titrations of —. A. Bose. *Chem. News*, 1918, 117, 369–370.

IBBOTSON has shown (this J., 1918, 268A) that sodium arsenite solution has an abnormally high reducing value when used for the titration of permanganate in the presence of nitric acid. The author records results of experiments which show that the nitric acid is not the cause of the abnormal reaction. Ibbotson considers that the cause is the formation of manganic compounds, but this does not seem possible. It may be that some complicated reactions take place during the titration, as up to this point titration with ferrous ammonium sulphate shows that all the manganese is present as permanganate.—W. P. S.

Sulphate ion; Volumetric estimation of the —. R. Howden. *Chem. News*, 1918, 117, 383.

A RAPID volumetric method for the estimation of the sulphate ion is based on the decomposition of alkali sulphate by barium carbonate, generating

alkali carbonate which can be estimated by titration. The sulphate solution is made exactly neutral to methyl orange and is then shaken with excess of pure precipitated barium carbonate in presence of phenolphthalein. N/10 hydrochloric acid is then run in until the red colour is discharged through the formation of bicarbonate, the solution is filtered and titrated, using methyl orange as indicator. The results obtained are only approximately correct, generally about 2% too low, from the figures quoted.—E. H. R.

Potassium in blood; Method for the estimation of —. S. W. Clausen. *J. Biol. Chem.*, 1918, 36, 479–484.

THE blood is oxidised by boiling with nitric and sulphuric acids and the potassium then precipitated by sodium cobaltinitrite. The precipitate is collected, decomposed by sodium hydroxide, and the nitrites then estimated by titration in acid solution with permanganate at 70° C. By this method, the amount of potassium in 1 c.c. of blood can be accurately estimated. (See further *J. Chem. Soc.*, Feb., 1919.)—H. W. B.

Mercury; Exact and rapid method for the estimation of — in the majority of its compounds. S. Piña de Rubies. *Anal. Fis. Quím.*, 1918, 16, 661–689.

THE method is a combination of the Rose-Finkener and Eschka processes, combining the accuracy of the former with the rapidity of the latter. As applied to the analysis of mercury minerals, it is as follows: The mineral is mixed intimately with fine iron powder and heated in a porcelain crucible into which is closely fitted as a cover a small crucible of gold or silver for the condensation of the volatilised mercury. The cooling of the upper crucible is effected by means of a small rubber bladder distended by a stream of cold water. The crucible with the condensed mercury is washed with alcohol and the weight of the mercury film determined. The results obtained by this procedure showed a maximum error of 0.07%. In the case of more volatile compounds of mercury, organic and inorganic, anhydrous potassium carbonate and barium peroxide, either separately or mixed, are substituted for the iron powder. When the substance to be analysed contains much moisture, e.g., a solution, a weighed quantity is evaporated to dryness in the porcelain crucible after the addition of sodium sulphide, and the mercury is determined as before. The method is applicable without special modification to the analysis of mercury fulminate and fulminate mixtures.—W. S. M.

Halogens in organic compounds; Determination of — by catalytic reduction. M. Busch. *Z. angew. Chem.*, 1918, 1, 232.

IN the catalytic reduction of organic halogen compounds by means of palladium, hydrazine (which is decomposed by the catalyst into nitrogen and hydrogen) may be substituted with advantage for a current of purified hydrogen (this J., 1916, 709). 0.2 gm. of the organic compound is dissolved in 40–50 c.c. of alcohol; 2 grms. of palladinised calcium carbonate or barium sulphate, 25 c.c. of 50% caustic potash, and 10 drops of hydrazine hydrate are added. The liquid is boiled under a reflux condenser for half an hour, after which the bulk of the alcohol is expelled by heating. The catalyst is filtered off, and the halogen determined in the filtrate.—W. R. S.

Nitrogen; Folin's direct nesslerisation method for the determination of —. L. Langstroth. J. Biol. Chem., 1918, 36, 377—380.

Two slight modifications of the Folin and Denis method (this J., 1916, 1133) are described in detail. —H. W. B.

Phosphorus; Quantitative determination of — by the nephelometric method. E. B. Meigs. J. Biol. Chem., 1918, 36, 335—346.

THE nephelometric method furnishes accurate results only when the prescribed procedure is strictly followed (compare Kober and Egerer, this J., 1915, 1170).—H. W. B.

Gas analysis; Bubbler for —. O. D. Burke. Chem. News, 1918, 117, 368—369.

THE bubbler consists of a flask closed with a cork carrying an inlet and an outlet tube for the gas. The lower end of the inlet tube is drawn out to a fine capillary and a second tube is sealed on to the side of the tube and bent round under the end of the capillary where it is flattened and the upper surface ground. The capillary point is made to fit tightly on the ground surface. The incoming gas is thus broken up into a number of very small bubbles. The apparatus is suitable for determining sulphur dioxide in gases by absorption in iodine solution. —W. P. S.

Analysis of "sulphite acid." Klason. See V.

Potassium salts. Spegazzini. See VII.

Carbon dioxide in carbonates. Van Slyke. See VII.

Sulphur in spent oxide. Twisselmann. See VII.

Aluminium hydroxide. Archibald and Habasian. See VII.

Magnesium ammonium phosphate and pyrophosphate. Karaoglanow and Dimitrow. See VII.

Separating platinum and iridium. Archibald and Kern. See VII.

Glycerol residues from Reichert-Meissl tests. Parkes. See XII.

Oil varnishes. De Waele. See XIII.

Agricultural lime. Conner. See XVI.

Potash [in fertilisers]. Keltt and Shliver. See XVI.

Raffinose. Pellet. See XVII.

Moisture in flour. Shutt and Moloney. See XIXa.

Milk control. Verda and Kirchensteins. See XIXa.

Determining lactose. Hildt. See XIXa.

Graduating butyrometers. Richmond. See XIXa.

Chlorine in foods. Weitzel. See XIXa.

Salmon oil. Bailey and Johnson. See XIXa.

Tyrosine in proteins. Johns and Jones. See XIXa.

Morphine in complex products. Tingle. See XX.

Detecting quinine. Salomon. See XX.

Pyrimidone reaction. Palet. See XX.

Alkaloids, glucosides, etc. Palet. See XX.

Yerba mate. Guglielmelli and Estrella. See XX.

Saccharin tablets. Richmond and others. See XX.

Pyrimidone and naphthols. Palet. See XX.

Uramino-acids. Rohde. See XX.

Hydrogen chloride in chloroform. Vorländer. See XX.

Arsenotungstic and arsenotungstomolybdic reagents. Guglielmelli. See XX.

Nitrogen in guncotton. Hervé. See XXII.

PATENT.

Gas-analysing apparatus. N. H. Wener, Assignor to Svenska Aktiebolaget Mono, Stockholm. U.S. Pat. 1,281,729, 15.10.18. Appl., 2.8.18.

A GAS-ANALYSING apparatus in which the gas is subjected to mechanical or chemical action before or after absorption and in which the movements of the gas are effected by a rising and falling liquid, is provided with an adjustable obstruction in the piping, of such form that the gas or liquid is obstructed when flowing in one direction but not in the opposite direction.—W. F. F.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Burris. Filters. 158. Jan. 2.
Fidler and Maxwell. Gas, coal, or oil fired continuous kilns of tunnel and car type. 392. Jan. 6.
Fidler and Maxwell. Gas or coal fired continuous kilns and dryers of tunnel and car type. 393. Jan. 6.
Naaml. Vennootsch. Vereen. Nederlandsche Rubberfabrieken. Filtering apparatus. 115. Jan. 2. (Holland, 25.1.18.)
Reid. Treating exhaust steam for use for heating, evaporating, or drying purposes. 20. Jan. 2.
Schuck. Production of nickel catalyser. 563. Jan. 6. (U.S., 9.1.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

17,740 (1916). Walker and Walker. Fractional distillation of liquids. (121,748.) Jan. 15.
14,410 (1917). Brettell and Adamson. Refrigerating systems and apparatus. (121,615.) Jan. 8.
15,824 (1917). Hinchley, Harper, and Power-Gas Corporation. Expressing liquid from materials. (121,759.) Jan. 15.
19,345 (1917). Wade (Davis). Refrigerating machines. (121,642.) Jan. 8.
2904 (1918). Curtis. See VII.
10,589 (1918). Wallwin. Gas-heated furnaces or muffles. (121,917.) Jan. 15.
17,277 (1918). Bradley. See XI.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

Ballingall and Dempster. 195. See VII.
Blakeley. Troughs for washing, coal, coke, etc. 554. Jan. 8.
Broadhead. Manufacture of gas. 55. Jan. 2. (Australia, 7.1.18.)

Dayton Metal Products Co. Fuel for internal-combustion engines. 371. Jan. 6. (U.S., 7.1.18.)
 Jefferies. Apparatus for producing gas. 359. Jan. 6.
 Marriott. Rock asphalt. 742. Jan. 10.
 Pace. Apparatus for making air gas. 707. Jan. 10.
 Player and others. 192. *See* X.
 Poore. Destructive distillation of wood, woody fibre, etc. 812. Jan. 11.
 Rector. Fuel-producing devices. 372. Jan. 6. (U.S., 9.10.17.)
 Schofield. Means for burning powdered fuel. 104. Jan. 2.
 Swinburne. Low temperature destructive distillation. 261. Jan. 4.
 Whitaker and Yeadon. System of low temperature carbonisation. 257. Jan. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

12,432 (1917). Smith. Briquets, and method of making same. (111,285.) Jan. 15.
 13,560 (1917). Pease. *See* VII.
 2878 (1918). Simpson and Moorhouse. Carbonisation and distillation of coal and other carbonaceous materials by electricity. (121,854.) Jan. 15.

III.—TAR AND TAR PRODUCTS.

COMPLETE SPECIFICATION ACCEPTED.

47 (1918). Westwood. Distillation of tar and the like. (121,804.) Jan. 15.

IV.—COLOURING MATTERS AND DYES.

APPLICATION.

Hill. Black colouring-matter, and process for dyeing animal fibres or fabrics. 330. Jan. 6.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

COMPLETE SPECIFICATION ACCEPTED.

2258 (1918). Bramson. Utilising dead leaves as stock for making paper pulp. (121,847.) Jan. 15.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Heymann. Dyeing. 798. Jan. 11.
 Hill. 330. *See* IV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Armour Fertilizer Works. Production of aluminium nitride. 365. Jan. 6. (U.S., 28.1.18.)
 Ballingall and Dempster. Apparatus for manufacture of hydrogen. 195. Jan. 3.
 Dawson. Manufacture of sulphuric acid. 265. Jan. 4.
 Dutt and Dutt. Manufacture of manganese dioxide and manganates. 834. Jan. 11.
 Edison Swan Electric Co., and Percival. Production of argon. 693. Jan. 9.
 Elektrizitätswerk Lanza. Manufacture of mercuric oxide. 388. Jan. 6. (Switzerland, 7.1.18.)
 Jackson (Air Reduction Co.). Production and extraction of cyanides. 381. Jan. 6.
 Soc. Industrielle de Produits Chimiques. Transforming free or combined ammonia mixed with inert gases or steam into ammonium sulphate or into concentrated and pure ammonia gas. 396. Jan. 6.

COMPLETE SPECIFICATIONS ACCEPTED.

13,560 and 13,608 (1917). Pease. Extraction of ammonia from gases and vapours and production of nitrogen compounds. (121,754.) Jan. 15.
 15,581 (1917). Craig, and Spence and Sons. Manufacture of chromium and iron compounds. (121,617.) Jan. 8.
 19,139 (1917). Tiniolo. Manufacture of nitric acid. (121,635.) Jan. 8.
 2904 (1918). Curtis. Composition for making lining of acid pots etc. (121,855.) Jan. 15.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Adair. Drying china clay. 526. Jan. 8.
 Haddan (Corning Glass Works). Borosilicate glass for use as filter to produce daylight effects. 674. Jan. 9.
 Haddan (Corning Glass Works). Potash glass for use as filter to produce daylight effects. 675. Jan. 9.
 Reeves and Tucker. Separation of molten glass etc. from mass. 53 and 54. Jan. 2. (U.S., 10.4.16.)

IX.—BUILDING MATERIALS.

APPLICATIONS.

Akerman. Cement kilns. 285. Jan. 4.
 Allender, Badder, and Burrows. Compositions for, and production of, waterproof cements and mortars. 180. Jan. 3.
 Field. Materials for rendering cement damp-proof. 686. Jan. 9.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

British Thomson-Houston Co. (General Electric Co.). Treatment of metals. 113. Jan. 2.
 British Thomson-Houston Co. (General Electric Co.). Metals and their manufacture. 212. Jan. 3.
 Coles. Apparatus for electrodeposition of iron. 721. Jan. 10.
 Coles. Means for coating articles with zinc. 722. Jan. 10.
 Fuller, and Fuller Engineering Co. Steel-smelting furnaces. 278. Jan. 4.
 Player, and Sterling Metals, Ltd. Crucible and like furnaces heated by liquid fuel. 192. Jan. 3.
 Schuck. 353. *See* I.
 Waring and Waring. Open-hearth furnaces. 532. Jan. 8.
 Weyman. Cleaning blast-furnace gases. 781. Jan. 10.
 Wilson. Treatment of arsenious and other ores. 243. Jan. 3.
 Worrall. Hard metal alloys. 374. Jan. 6.

COMPLETE SPECIFICATIONS ACCEPTED.

19,057 (1917). Parkinson Stove Co., and Thompson. Protection of iron and steel surfaces. (121,781.) Jan. 15.
 19,220 (1917). Armstrong, Whitworth and Co., Trevelyan, and Rowden. Production of steel from scrap. (121,785.) Jan. 15.
 3420 (1918). Humbert. Process of making iron and steel in electric furnaces. (121,674.) Jan. 8.
 4633 (1918). Industrie- en Mijnbouw-Mij. Titan. Smelting titaniferous iron materials. (114,309.) Jan. 15.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

- Antonoff. Electric batteries. 608. Jan. 9.
 Armour Fertilizer Works. Electric furnaces. 364. Jan. 6. (U.S., 28.1.18.)
 Coles. 721. *See* X.
 Fawcett and Hoyle. Electric furnaces. 222. Jan. 3.
 Hatfield. Primary batteries. 355 and 356. Jan. 6.
 Hatfield. Primary cell. 357. Jan. 6.
 Johnson (Commercial Truck Co.). Electric batteries. 466. Jan. 7.
 Soc. Electro-Métallurgique Française. Manufacture of carbon electric conductors. 390. Jan. 6. (Fr., 26.1.18.)
 Twist. Electric accumulators. 43. Jan. 2.

COMPLETE SPECIFICATIONS ACCEPTED.

- 2878 (1918). Simpson and Moorhouse. *See* II.
 3420 (1918). Humbert. *See* X.
 17,277 (1918). Bradley. Electrical treatment of gases. (120,573.) Jan. 8.

XII.—FATS; OILS; WAXES.

APPLICATION.

- Schuck. 353. *See* I.

COMPLETE SPECIFICATION ACCEPTED.

- 13,091 (1918). De Bruyn. Imparting a definite flavour and aroma to edible oils and fats. (121,711.) Jan. 8.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

- Bowles, and Titanine, Ltd. Manufacture of varnishes or dopes. 467. Jan. 7.
 Oleghorn, and Gayner Pneumatic Co. Production of materials for coating substances to protect them or render them non-porous. 758. Jan. 10.
 Flakes Aktieselskabet, Schou, and Wingen. Manufacture of painting, priming, etc. compositions. 290. Jan. 4.
 Kohler. Producing colophony of high quality from old natural resin or conifers. 369. Jan. 6. (Sweden, 15.1.18.)
 MacFarlane and Muller. Manufacture of luminous paint. 468. Jan. 7.

COMPLETE SPECIFICATIONS ACCEPTED.

- 18,891 (1917). Craven, and Yorkshire Dyeware and Chemical Co. Manufacture of linoleum. (121,777.) Jan. 15.
 9746 (1918). Naaml. Vennootsch. Nederlandsche Maatsch. *See* XIV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

- Galsman and Rosenbaum. Vulcanising natural and artificial caoutchouc etc. 704. Jan. 10.
 Iddon. Rubber mixing, grinding, sheeting, etc. mills. 5. Jan. 2.
 Jackson (American Rubber Co.). Vulcanising rubber goods. 384. Jan. 6.
 Van Raap. Regenerating vulcanised rubber. 227. Jan. 3. (Holland, 8.1.18.)

COMPLETE SPECIFICATION ACCEPTED.

- 9746 (1918). Naaml. Vennootsch. Nederlandsche Maatsch. tot Exploitatie van Optimiet Fabrieken. Manufacture of a product substituting ebonite, bakelite, etc. (118,270.) Jan. 8.

XVI.—SOILS; FERTILISERS.

APPLICATION.

- Furse. Manufacture of manure from house and other refuse. 663. Jan. 9.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATION.

- Boldin and Effront. Treatment of residues containing carbohydrates. 131. Jan. 2. (Fr., 17.1.18.)

XVIII.—FERMENTATION INDUSTRIES.

APPLICATION.

- Pascal. Manufacture of ethyl alcohol etc. 224. Jan. 3. (Fr., 16.1.18.)

COMPLETE SPECIFICATION ACCEPTED.

- 19,326 (1917). Barbet et Fils et Cie. Apparatus for rectifying phlegms, wines, or fermented musts. (121,797.) Jan. 15.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

- Callimachi. Manufacture of flour from potatoes. 662. Jan. 9.
 Hucks. Flavouring mineral waters etc. 68. Jan. 2.

COMPLETE SPECIFICATIONS ACCEPTED.

- 585 (1918). Hamilton and Quirk. Sterilising cereals, nuts, seeds, etc. (121,650.) Jan. 8.
 7300 (1918). Graham. Bread and other food products and process of producing same. (116,272.) Jan. 15.
 13,091 (1918). De Bruyn. *See* XII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATION.

- Soc. Chim. des Usines du Rhône. Preparation of primary alcohols. 217. Jan. 3. (Fr., 22.1.18.)

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

COMPLETE SPECIFICATION ACCEPTED.

- 18,648 (1917). Pedersen. Production of coloured photographic views. (121,776.) Jan. 15.

XXII.—EXPLOSIVES; MATCHES

APPLICATIONS.

- Gardner, Hargreaves, and Robural and Ammonite. Explosives. 820. Jan. 11.
 Nobels Explosives Co., Lowndes, Rintoul, and Weir. Explosives. 746. Jan. 10.

XXIII.—ANALYSIS.

APPLICATION.

- Ommanney. Instrument for facilitating calculation depending on relations between pressures, densities, temperatures, and percentage composition of gases, and recording observations of these quantities. 484. Jan. 7.

I.—GENERAL; PLANT; MACHINERY.

PATENTS.

Gases; Electrical treatment of — L. Bradley, East Orange, N.J., U.S.A. Eng. Pats. (A) 107,389, (B) 119,236, (C) 119,237, and (D) 119,238, 21.6.17. (Appls: 8296/17 and 14,943, 14,944, and 14,947/18.) Int. Conv., 21.6.16.

(A) Gases are subjected to a silent discharge from a powerful current in a number of treater tubes or ducts, which act as collecting electrodes for the deposited particles of dust, a wire chain, or the like, arranged along the axis of the tube, acting as the discharge electrode. The gases are led to and from the treater ducts by main ducts, or common headers, arranged at the entrance and exit parts of the treater tubes. In order to control or maintain a uniform draught through the treater ducts, a localised frictional resistance is interposed in the flow of the gases, *e.g.*, by making the inlet or outlet (but not both) of each treater duct smaller in cross-sectional area than the duct itself. An increased velocity through any one duct will result in greater friction in the constricting means, thus tending to equalise the velocity in the different treater ducts. The heat of the gas may be maintained and the temperature kept uniform by providing suitable insulation or by interchange of heat. (B) The conductivity of the gas may be maintained by supplying water vapour to it, the spray or steam wetting the particles of dust. (C) The treater ducts are square or rectangular in cross-section, and are divided by partitions. (D) The velocity is equalised in the different treater ducts by passing the gases in a downward direction to maintain a down draught, so that any tendency to inequality of flow (by reason of inequality of temperature) will be resisted by a tendency to an upward draught. The gases may be afterwards passed in an upward direction through one or more ducts to separate the finer particles.—B. N.

Separation of suspended particles from gaseous bodies; Electrical — H. A. Burns, Finchley. Eng. Pat. 120,994, 11.12.17. (Appl. 18,349/17.)

In apparatus for the electrical precipitation of suspended particles from gases, the insulators are mounted in chambers separated from that in which the dust-separating devices are mounted, and the connection between the chambers is constricted so as to hinder the dust from passing into the insulator chambers. A current of cleaned air or gas is passed into the insulator chambers at a slightly higher pressure than that obtaining in the dust chambers and is heated so that it may not deposit moisture on the insulators.—W. H. C.

Ball mill and sifting device. C. Candlot, Paris. Eng. Pat. 115,224, 13.12.17. (Appl. 18,460/17.) Int. Conv., 26.4.17.

A BALL mill is divided into two compartments separated by a sifting device. In the first compartment the preliminary grinding is effected and the material passes to the sifting device, which consists of superposed plane screens arranged in the form of a cone and shielded from the action of the balls. The fine material passes through to the finishing compartment and the insufficiently ground portion is returned to the first compartment.—W. H. C.

Pebble or ball mill. C. H. Stave, Thornton, Ill. U.S. Pat. 1,283,589, 5.11.18. Appl., 4.3.18.

A CYLINDRICAL pebble or ball mill is clamped into a frame so that the axis of the cylinder is oblique to the axis about which the frame is rotated.

—W. H. C.

Crusher. W. A. Kraemer, Chicago, Ill. U.S. Pat. 1,282,870, 29.10.18. Appl., 28.1.18.

MATERIAL to be crushed is fed from a hopper through an aperture in a fixed crushing plate. A bar of prismatic cross-section is arranged parallel to, and with an edge facing the crushing plate, and means are provided for moving the bar parallel to the plate. This bar carries a crushing plate formed of an angle bar longer than the aperture in the fixed plate, and mounted on the supporting bar so as to overlap the two faces the meeting edge of which faces the fixed plate. Dowel pins carried by the supporting bar project loosely through apertures in the angle bar, and springs are interposed between the supporting bar and each web of the crushing bar. The crushing bar is mounted to oscillate about an axis between the supporting bar and the fixed plate.—W. F. F.

Drying chambers. O. H. Abbott, London. Eng. Pat. 120,635, 21.11.17. (Appl. 17,130/17.)

THE drying chamber is placed over a gas-heated furnace and is provided with a double bottom, through which the hot gases from the furnace pass in a tortuous path formed by vertical baffle-plates. Air enters the drying chamber at the bottom, and passes in the same direction as the gas through a horizontal compartment also provided with vertical baffles, just above the double bottom, whereby the air is heated. The air is then delivered into a vertical conduit at one side of the chamber, the remainder of the chamber being filled with superposed perforated drying trays, slightly inclined to the horizontal and spaced apart. The hot gases pass upwards to the exit flue through a vertical pipe in the vertical air conduit, to increase the air draught, and the conduit is also provided with horizontal baffles extending towards the tray shelves but leaving a space which decreases progressively from the bottom upwards. The hot air is thereby caused to circulate over and through the trays and is finally discharged through a pipe surrounding the waste gas flue.—W. F. F.

Drying, conditioning, and regulating the moisture content of hygroscopic materials; Method of and apparatus for — W. H. Carrier, and Carrier Engineering Corporation, New York. Eng. Pat. 121,080, 21.5.18. (Appl. 8464/18.)

THE materials to be treated are supported within a chamber and air is caused to circulate around and through them. In order to maintain the circulating air in the desired condition of temperature and humidity, a regulated portion of fresh air of the requisite temperature and humidity is introduced into the chamber through nozzles at one side. The jets of air are so adjusted that any desired proportion of the circulating air which is about to be discharged through the exhaust ports can be withdrawn, mixed with fresh air, and recirculated over the material in the chamber. The temperature and humidity of the air to be introduced are regulated by a system of thermostats and hygrometers which control the heating and drying or humidifying arrangements.—W. H. C.

Drying of solid substances [e.g., pigments] precipitated from solution in water or other liquids. A. P. Laurie, Edinburgh. Eng. Pat. 121,372, 29.12.17. (Appl. 19,209/17.)

THE liquid containing the solid in suspension is exposed to a low temperature in order to freeze the liquid. The mass is then thawed and after draining away as much liquid as possible the residue is dried in the usual way. Precipitated pigments treated in the above manner dry to a powder and not into cakes or lumps.—W. H. C.

Dehydrating vegetable, textile, and other substances; Methods of and apparatus for —. J. G. Maxwell, London. Eng. Pat. 121,394, 6.2.18. (Appl. 2178/18.)

THE material to be dried is heated for a short time in a rotary or other apparatus to between 400° and 600° F. (about 200°—315° C.) in a quiescent atmosphere, and then the drying is completed by a current of air at a temperature below the boiling point of water.—W. H. C.

Dehydrating vegetable and other substances; Method and apparatus for —. G. H. Benjamin, New York. U.S. Pat. 1,284,218, 12.11.18. Appl. 7.6.18.

THE material to be dehydrated is subjected to the action of radiant heat for a sufficient time to induce exudation of the contained moisture, and at intervals to the action of heated air currents. The material is supported in V-shaped containers formed of a reticulate material, and the radiant heat is supplied by electric lamps placed in proximity to the containers.—J. H. P.

Dryer. O. C. McCormick, Cleveland, Ohio. U.S. Pat. 1,283,242, 29.10.18. Appl., 12.3.18.

THE material to be dried is charged into carriers supported on an endless sprocket chain which passes over sprocket wheels mounted on a frame within a drying chamber. The chain with the charged carriers travels in a zig-zag path through the chamber from the charging door at one end to the discharging door at the other end and then returns the empty carriers to the charging door.—W. H. C.

Conveyor and its application for drying, mixing, screening, and other processes. W. R. Bates, Cricklewood, and H. R. L. Walker, London. Eng. Pat. 120,764, 20.11.17. (Appl. 17,064/17.)

A HORIZONTAL cylinder mounted on friction wheels is divided into a number of compartments by cross partitions or discs mounted on an axial shaft. The partitions are mounted either at right angles or inclined to the axis of the cylinder and each has a sector or quadrant cut away and is provided with a flange. The materials to be treated are fed into one end of the cylinder by a screw conveyor. When the central shaft is still and the cylinder is rotated the materials are agitated but are not moved forward, but when both the shaft and the cylinder are in motion the materials are transferred from compartment to compartment. Gaseous or liquid treating agents may be passed through the cylinder in the opposite direction to that taken by the materials.—W. H. C.

Fractional distillation of mixtures of liquids which are not miscible with water [e.g., light tar oil etc.]; Apparatus for —. A. Goyvaerts, P. Becquevort, and H. E. Bossut, London. Eng. Pat. 120,940, 27.8.17. (Appl. 12,201/17.)

THE mixture of liquids is fed continuously from an overhead tank into the first of a series of stills. Open steam is supplied to this still and a mixture of steam and vapour passes over to the next still in the series. Here the vapour of the constituent with the highest boiling point and some of the steam condense, while the vapours of the constituents of lower boiling point and the uncondensed steam pass on to the next still. The vapours from the last still of the series pass through a condenser. The level of the liquid in the stills is kept constant by drawing off from each

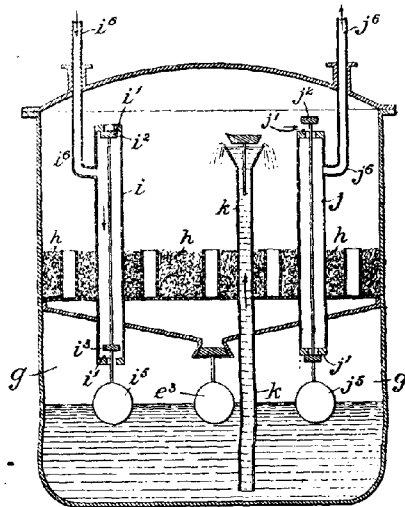
a portion of the liquid condensed therein. It is claimed that by one distillation in this apparatus there can be recovered from crude benzol four fractions consisting of commercial benzol (from the condenser), commercial toluol from still No. 3, a mixture of xylenes, cymene, and crude naphtha, of b.pt. 135°—190° C., from still No. 2, and creosote oil from still No. 1.—W. H. C.

Steam heating of ovens and the like. F. O. Bynoe, London. Eng. Pat. 121,001, 13.12.17. (Appl. 18,504/17.)

THE heating is effected by grids of "Field tubes" attached to inlet and outlet headers. Steam at high temperature but low pressure is passed into the inner tubes and returns along the annular space between the two tubes. The inlet header has a flange on one side provided with perforations into which the inner tubes are fixed. The outlet header has flanges on both sides. The outer tubes are fastened into a set of holes in the flange on one side of the header and the inner tubes pass through holes in the flange on the other side and into the outer tubes. The two headers are bolted together to form a steam-tight joint.—W. H. C.

Extractors, dyeing machines, or the like. British Dyes, Ltd., J. Turner, and T. P. K. Crosland, Huddersfield. Eng. Pat. 121,199, 13.12.17. (Appl. 18,464/17.)

THE liquid in the lower chamber being at the level shown in the figure, air or steam is passed through the pipes, *i*⁵, *i*, and the valve, *i*¹, *i*², into the space, *g*, and forces the liquid up the pipe, *k*, into the upper chamber, the air in which escapes through *j*¹, *j*², *j*, and *j*³. So long as the bottom of the



pipe, *k*, is sealed by the liquid the pressure keeps the valves in the position shown, but as soon as it is unsealed the valves are reversed and the air or steam enters the upper compartment through the valves, *i*¹, *i*², and forces the liquid through the material, *h*, into the lower compartment, the air in which escapes through the valves, *j*¹, *j*², and the pipes, *j*, *j*³. When the liquid has again collected in the lower chamber the floats, *i*³, *i*⁴, and *j*³, rise and reverse the valves, and the process is repeated.—W. H. C.

Extracting solids; Process of — E. E. Howson, Salt Lake City, Utah. U.S. Pat. 1,284,349, 12.11.18. Appl., 5.10.17.

THE material to be extracted held in suspension in a liquid is delivered successively to a series of filters subjected to an intermittent jarring action (see following abstract). The liquid is drawn off and a submerging liquid delivered successively to the filters from which the liquid has been removed and a "mixing and stirring fluid" is admitted to the material, this fluid being afterwards allowed to escape.—J. H. P.

Filtering device. E. E. Howson, Salt Lake City, Utah. U.S. Pat. 1,284,347, 12.11.18. Appl., 5.10.17.

A NUMBER of filters are disposed round a common axis and stationary relative to it. The material to be filtered is supplied to the filters successively and the latter can be tilted to discharge the residue on to a carrier mounted to revolve about the axis and below the filters. Means are provided for shaking the filters whilst they are being tilted.—J. H. P.

Gold, sand, coal and other minerals; Apparatus for screening and washing — R. W. Pleasance, Manor Park, Essex. Eng. Pat. 121,512, 17.12.17. (Appl. 18,744/17.) Addition to Eng. Pat. 28,675, 12.12.12.

In screening and washing apparatus of the type described in the prior patent (this J., 1913, 1017), the hopper containing the material is provided with a perforated bottom and sides, and water is supplied from a sprinkler over the hopper. The material is washed on to a series of oppositely inclined perforated screens, alternately coarse and fine, arranged in a vertical casing. The material is graded by the coarse screens, which are progressively finer, and the dirt is washed through the fine screens and removed. The water passing through the hopper is carried by pipes to the top of the second and third screens.—W. F. F.

Grading or sizing of materials of all kinds; Method of and apparatus for the — C. Q. Payne, New York. U.S. Pat. 1,283,284, 29.10.18. Appl., 6.12.16. Renewed 3.11.17.

MATERIAL composed of particles of different sizes is charged in a thin sheet upon a flexible endless belt the upper surface of which is inclined transversely at a progressively increasing angle so as to form a helicoidal surface between its end supports. The belt is moved longitudinally so as to carry the material at a high speed into zones of gradually increasing transverse inclination. The material is discharged, in gradually decreasing sizes, transversely to the motion of the material, the different sized particles being separately collected.—B. N.

Liquids [e.g., water]; Apparatus for use in treating — with gases. S. H. Menzies, London. Eng. Pat. 121,521, 10.12.17. (Appl. 18,870/17.)

A CYLINDER of liquefied gas (e.g., chlorine) is connected with a measuring vessel consisting of a plunger working in a sleeve, the working space being adjustable to contain the particular quantity of gas desired. The gas is measured under the vapour pressure of the liquefied gas in the cylinder. The measuring vessel is connected by an outlet tube with an absorbing vessel holding a measured volume of the liquid (e.g., water) to be charged with the gas. Valves placed on the inlet and outlet tubes of the measuring vessel are linked together, so that one is opened and the other closed by the same movement; or, the inlet and

outlet of the measuring vessel may be controlled by two needle valves. The solution of the gas obtained in the absorption vessel may be used as a strong solution for adding to a larger volume of liquid to obtain a dilute solution of definite strength.—J. H. J.

Gas; Apparatus for applying — to fluids. C. F. Wallace, New York, and M. F. Tlernan, New Rochelle, N.Y. U.S. Pat. 1,285,496, 19.11.18. Appl., 28.3.17.

FLUID under pressure is delivered into a mixing chamber provided with a siphon, which draws off a portion of the fluid whenever the level rises to a certain point. A source of gas is connected to the mixing chamber by a passage provided with a valve, which is opened by the negative pressure established by the siphoning off of the fluid.

Refrigerating apparatus. Ransomes and Rapier, Ltd., and R. J. Cracknell, London. Eng. Pat. 121,522, 19.12.17. (Appl. 18,875/17.)

Two closed cylindrical casings are mounted a short distance apart on the same horizontal shaft, and one of them contains a rotary compressor, preferably of the type in which a rotor with channels on its periphery rotates within a drum containing liquid, e.g., mercury, the drum rotating freely on bearings carried by eccentrics mounted on the shaft. A weight is connected to the eccentrics to hold them stationary during the rotation of the rotor and casing. The driving shaft is hollow and serves to convey the compressed gas to the other rotating casing which acts as a condenser. The liquefied gas collects in a layer around the periphery of this casing, and a pipe parallel to the shaft connects the two casings. The ends of the pipe are turned radially outwards and terminate near the peripheries of the casings. The flow of liquid from one casing to the other thus depends on the relative pressures in them. The compressor and condenser casings dip into brine and cooling water respectively, contained in suitable vessels, the brine being used for refrigerating purposes.—W. F. F.

Pump; Internal-combustion — C. A. Clark, Syracuse, N.Y., Assignor to Humphrey Gas Pump Co. U.S. Pat. 1,282,757, 29.10.18. Appl., 7.12.15.

In an internal combustion pump having a reciprocating column of liquid, the combustion chamber contains a reciprocating piston carried by a hollow plunger which divides the space above the piston into a central and an annular space, both separated from the combustion space by the piston. Gas and air are drawn through valves into the central and annular spaces respectively when the piston descends, and then pass through valves in the piston into the combustion chamber below when the piston ascends. The gas and air are then mixed, compressed, and ignited. The gas and air are thus kept separate from one another and from the hot burnt products of the previous charge until they are ready for mixing and ignition. Means may also be provided whereby air may be added to the gas in the central space.—W. F. F.

Evaporator. A. Harvey, Greenwich, Conn. U.S. Pat. 1,282,825, 29.10.18. Appl., 22.10.15.

AN evaporator comprises a number of chambers each provided with a separate air inlet. The air supply to each inlet is heated in a separate heater, so that the temperature of the air supplied to each chamber may be adjusted independently.—W. H. C.

Evaporator. J. A. Meroney, Assignor to Nupro Evaporator Co., San Francisco. U.S. Pat. 1,283,254, 29.10.18. Appl., 21.3.17.

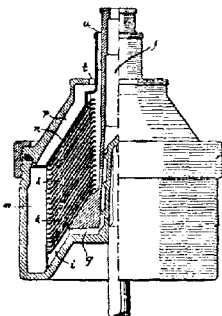
THE apparatus consists of an oven containing independent superposed sets of trays which can be introduced from opposite ends of the oven. An open space is left between the adjacent ends of the two sets of trays, and a central suction apparatus at the top of the oven draws filtered air upwards through the open space; discharge passages leading from the fan return the air through filters to opposite sides of the oven bottom. Fan blowers above each series of trays force a portion of the heated air downward through the trays.—W. R. S.

Furnace; Regenerating ——. C. E. Duncan, Johnstown, Pa. U.S. Pat. 1,283,117, 29.10.18. Appl., 10.2.17.

THE checker-work of a regenerating chamber for furnaces is built up in several sections, spaced apart so as to form vertical passages between adjacent sections extending through the checker-work down to the underlying flues.—J. F. B.

Separator; Centrifugal ——. F. S. Snyder, Poughkeepsie, N.Y., Assignor to The De Laval Separator Co., New York. U.S. Pat. 1,283,343, 29.10.18. Appl., 31.8.17.

LIQUID having a heavy slimy constituent is fed by the central tube, *f*, and passages, *g*, *i*, to the annular space, *m*, in a rotating bowl. The central portion of the bowl is occupied by a number of superposed perforated conical plates, *k*, dividing the liquid into thin layers. A non-perforated plate,



n, partly conical and partly cylindrical, is mounted above the perforated plates so as to leave only a narrow space between its outer rim and the inner wall of the bowl. The lighter constituents pass upwards between the conical plates and are discharged at the outlet, *u*, while the heavier material passes upwards through the space, *p*, to its discharge outlet, *t*. Radial wings are provided in the spaces, *g*, *i*, *m*, and *p*.—W. F. F.

Separator; Centrifugal ——. A. M. Mark and B. H. McElvain, Denver, Colo. U.S. Pat. 1,283,846, 5.11.18. Appl., 18.2.16.

MATERIAL to be separated is fed through a vertical pipe on to a conical distributor supported in a rotary separating-pan with its apex in the mouth of the pipe, which just projects through the cover of the pan. The distributor is arranged centrally in, and just above the base of the pan. The side wall of the pan is flared outwards from the bottom and a spiral riffler is arranged around the inner face of the wall. The heavier separated material is thus guided to a discharge opening immediately

below the upper end of the riffler, the opening being protected so as to prevent the material from passing beyond it. The solid material falls into a discharge shoot, and another shoot is provided for the lighter material which overflows the upper edge of the pan.—W. F. F.

Filtering apparatus. O. J. Salisbury, Assignor to United Filters Corporation, Salt Lake City, Utah. U.S. Pat. 1,283,925, 5.11.18. Appl., 3.3.17.

A HOLLOW horizontal rotating shaft, extending through a tank containing the liquid to be filtered, carries transverse hollow filtering discs which have their lower portions immersed in the liquid. The interior of each filtering element is connected to a suction device through the hollow shaft, and stationary scrapers are arranged above the liquid to detach deposited material from the discs. Vertical rotating spiral conveyors are arranged between the discs to remove the solid material, and are driven by bevel gearing from a single shaft arranged horizontally above the tank.—W. F. F.

Retort; Continuous rotary ——. P. S. Shoaff, Long Beach, Cal. U.S. Pat. 1,284,479, 12.11.18. Appl., 21.9.16.

A ROTARY retort is inclined downwards towards the burner end of the furnace chamber. The interior of the retort has no communication with the furnace chamber. A stack leads from the top of the chamber at the burner end. Baffle-walls are fixed in the chamber in such a manner that the flame and heating gases pass along the bottom of the retort, then around both sides and over it to the stack. The material to be treated is fed at the upper end and withdrawn from the lower end of the retort.—J. H. P.

Kilns; Apparatus for utilising the waste heat and increasing the circulation of the air during the drying and burning processes in ——. T. B. Sullivan, Kansas City, Mo. U.S. Pat. 1,284,943, 12.11.18. Appl., 12.12.17.

THE air supply for the furnace of a kiln is pre-heated by passing it through a pipe which enters the smoke stack below the level of the grate, and passes upwards through the stack. The pipe continues outwards through the stack and finally discharges into the furnace near the grate.—W. F. F.

Sublimation apparatus. J. D. Sartakoff, New York. U.S. Pat. 1,284,787, 12.11.18. Appl., 13.4.17.

THE apparatus comprises a horizontal rotary drum provided with a central perforated pipe through which a gaseous heating agent is introduced so as to maintain the temperature of the whole chamber substantially constant. Solid material is fed into one end of the drum and a number of lifting buckets attached to the inner wall of the drum elevate and dump the material within the drum. Baffle plates are mounted on the perforated pipe, and the vapours and gases pass through a tapering exit into a condensing chamber.—J. H. P.

Refrigerating machines. H. Wade, London. From D. I. Davis, Chicago, Ill., U.S.A. Eng. Pat. 121,642, 31.12.17. (Appl. 19,348/17.)

SEE U.S. Pat. 1,280,101 of 1918; this J., 1918, 757 A.

Corrosive liquids or substances; Apparatus for manufacturing, storing, treating, or transporting ——. I. Wolf, London. U.S. Pat. 1,285,537, 19.11.18. Appl., 23.2.18.

SEE Eng. Pat. 113,992 of 1917; this J., 1918, 229 A.

Gas washer. U.S. Pat. 1,283,763. See II.A.

Conveying and absorbing gases. U.S. Pat. 1,282,799. See VII.

Optical pyrometry. U.S. Pat. 1,282,967. See XXIII.

II.A.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Oxidation and ignition of —. R. V. Wheeler. Chem. Soc. Trans., 1918, 113, 945–955.

In a series of experiments in which air or oxygen was circulated in a closed system through a column of powdered, freshly won coal heated in a constant-temperature oven, the rate of disappearance of oxygen being measured by the fall in pressure, results have been obtained which, in general, agree with those recorded by previous investigators. The occluded gases which can be removed from a sample of coal by exhaustion at 100° C. contain a large proportion of the oxides of carbon if the coal has been previously "weathered" either naturally or artificially, and in this respect differ from the gases which are removed from newly won coal. Comparative experiments, in which the gases were removed at 15° C. and at 100° C., show that although some oxygen is occluded by coal and can be removed at the ordinary temperature by physical means, the major portion of the oxygen retained by the weathered coal only makes its appearance in the form of oxides of carbon when the temperature of the coal is raised. The results suggest that the first step in the oxidation of coal is the formation of an addition compound or complex of oxygen with one or more of the substances present in the coal. Incidentally it has been found that the quantity of gas removed from a weathered coal by exhaustion at 100° C. is considerably increased when the coal has been "weathered" by contact with air dried over calcium chloride. In order to determine what relationship, if any, there is between the chemical composition of a coal and its ignition temperature, a number of coals were tested by heating finely powdered and sifted samples in tubes embedded in a sand bath the temperature of which could be slowly raised by electrical heating, a current of air being drawn through the column of coal at constant speed. Thermometers embedded in the coal and in the sand respectively were read at frequent intervals. Two temperature-time curves were thus obtained and it was found that these curves intersected at a certain temperature. This temperature is regarded for comparative purposes as the "ignition temperature." The results obtained with samples of coals containing different quantities of oxygen show clearly that the most highly oxygenated coals are those which have the lowest "ignition temperature" and are therefore most liable to self-heating. It is probable that such highly oxygenated coals contain considerable quantities of substances, the molecular structure of which approximates closely to that of carbon. The reaction responsible for the self-heating is supposed to consist in the attachment of oxygen to molecules of this type.—H. M. D.

Ammonia recovery [from coke-oven gas]; Effects of —. T. B. Smith. Midland Coke Oven Managers' Assoc., Dec. 21, 1918. Gas J., 1918, 144, 161–162.

The effects of the direct and indirect processes for the recovery of ammonia from coke-oven gas on the other by-products are compared. In the direct method a thicker tar is produced and more

light oils pass to the benzol plant, which consequently has to perform more work. The intermediate dephlegmation fractions of the crude benzol still or the crude benzol itself contain 7 to 10% of phenolic bodies which the author recommends should be recovered. In the direct process, naphthalene causes serious trouble in the condensing plant following the ammonia absorber and a suitable solvent must be employed. The effluent from these condensers differs considerably from that of the usual ammonia stills, a typical analysis showing: free ammonia, 0.0184%; fixed ammonia, 0.0061; total ammonia, 0.0245; carbonic acid, 0.0088; hydrochloric acid, 0.0010; hydrocyanic acid, 0.0135; hydrogen sulphide, 0.0115; sulphur as sulphates, 0.0012; sulphur as thiocyanate, 0.0025; total sulphur, 0.0148; phenols, 0.1947%. Such an effluent can be used for coke quenching without seriously affecting the appearance of the coke. The hydrocyanic acid in the gas may be recovered by Bueb's process prior to the gas entering the ammonia absorber, but the author points out that a much purer product would result if the recovery were made after the gas had passed the absorber. If, however, no attempt is made at recovery a considerable proportion is taken out at the benzol absorbers and evolved again at the vapour pipe of the crude benzol still. The pink colour frequently met with in ammonium sulphate from the direct process is due to the presence of traces of ferric thiocyanate.—T. F. E. R.

Liquid fuels. A. Guiselin. Mem. et Compt. rend. Trav. Soc. Ing. Civils de France, Oct., 1918, 453–548.

The author discusses the subject of liquid fuels with special reference to the needs of France. The paper includes sections on the production of fuel oils from bituminous shales, coal tar, coal waste, lignite, peat, etc., and on the use of alcohol as fuel.

Calorimetric lag. Calorimetric precision. Calorimetric methods. White. See XXIII.

PATENTS.

Fuel; Production of artificial — and utilization of peat. T. Twynam, Redcar. Eng. Pat. 121,373, 31.12.17. (Appl. 19,245/17.)

Wet or partially air-dried peat is intimately mixed by grinding, with about one-eighth of its weight of dry pitch and coke dust, or small coal, to give a product when dry approximating in composition to coal. The moist mixture is either briquetted or flattened into pieces of suitable thickness and dried by means of waste steam.—T. F. E. R.

Fuel briquette. C. H. Smith, Short Hills, N.J., Assignor to International Coal Products Corporation, Richmond, Va. U.S. Pat. 1,284,939, 12.11.18. Appl., 18.7.18.

A fuel briquette is composed of finely-divided, partly carbonised coal, and pitch in such proportions that the total amount of volatile hydrocarbon is about 11–17%.—W. F. F.

Coal-washings; Settling apparatus for —. E. G. Burks and N. Hayes, Ensley, Ala. U.S. Pat. 1,284,586, 12.11.18. Appl., 26.1.16. Renewed, 25.4.18.

The settling tank of a coal-washing apparatus is constructed with a sloping bottom formed by four sloping sides. A well is provided at the bottom, formed by the downward extension of an opposite pair of sloping walls, the other pair of walls of the

well being vertical. The tank is divided into three compartments by two vertical partitions, each partition being formed of spaced perforated walls enclosing a layer of granulated material. The coal and dirty water are delivered into the central compartment, and the water is filtered through the partitions into the side compartments and withdrawn from them. An inclined endless elevator has its lower end projecting into and closely fitting into the well. (See also U.S. Pat. 1,201,143; this J., 1916, 1209.)—W. F. F.

Coking pitch. R. A. Lee, Brooklyn, N.Y., Assignor to The Barrett Co., New York. U.S. Pat. 1,283,229, 29.10.18. Appl., 28.4.17.

COKE is produced from pitch or a similar hydrocarbon liquid by heating it under several atmospheres pressure to a temperature in excess of the boiling point of a substantial portion of its constituents, say 600° F. (315° C.). By suddenly reducing the pressure to atmospheric, and without the application of further heat, vapours are evolved and a residue of coke remains.—T. F. E. R.

Coked products; Method of making low density — H. Rodman, Edgewood, Pa., Assignor to Rodman Chemical Co. U.S. Pat. 1,283,310, 29.10.18. Appl., 7.2.17.

COKING material or a mixture containing such is made into pellets or fragments and suddenly raised to a coking temperature.—T. F. E. R.

Gas-producer. L. Nelson, Wellington, N.Z. Eng. Pat. 112,128, 8.12.17. (Appl. 18,249/17.) Int. Conv., 8.12.16.

THE apparatus consists of a down-draught producer with scrubbers, contained in a compact shell, for use in conjunction with marine engines. Air supplied by a fan or drawn in by the suction of the engine passes into a perforated distributing pipe in the upper part of the producer, and downwards through the incandescent fuel. The gas passes down through the grate of the producer, then under a partition into the scrubbers. After passing up one scrubber and down the other, it proceeds to the engine. The scrubbers are packed with small coke or pumice and water is sprayed in at the top and passes off at the bottom to the ashpit. Clinker is extracted from the producer by operating the sliding grate.—T. F. E. R.

Gas-producer. H. C. Perdue, Valparaiso, Ind., Assignor to Morgan Construction Co., Worcester, Mass. U.S. Pat. 1,284,138, 5.11.18. Appl., 1.6.14.

IN a gas producer having a rotary section carrying the fuel, a stationary member is arranged to rest on the fuel surface to keep the surface even. This member may be adjusted about an axis eccentric to the axis of the producer so as to vary its position on the fuel bed and thus vary the accumulation of fuel towards or away from the centre of the fuel bed. Means are also provided to adjust the position of the fixed member axially to correspond with variations of level of the fuel bed.—W. F. F.

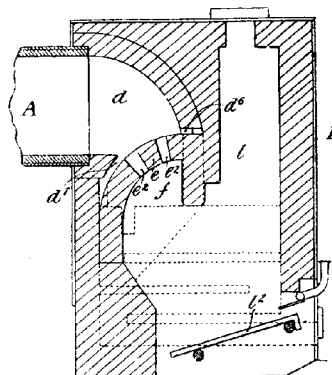
Gas-producer. E. A. W. Jefferies, Assignor to Morgan Construction Co., Worcester, Mass. U.S. Pat. 1,284,694, 12.11.18. Appl., 23.1.15.

THE rotating body of the producer is fed with fuel from a hopper above placed eccentrically to the axis of rotation. From the top of the producer depends a swinging member which levels the fuel and at a determined height puts into motion a weighted lever which automatically shuts off or

controls the supply of fuel. The weighted lever can be disconnected from the swinging member for hand operation. In an alternative arrangement the fuel-feeding device rotates eccentrically and the producer body remains stationary.—T. F. E. R.

Producer-gas; Furnaces for the generation and combustion of — F. J. Grocott, Birmingham. Eng. Pat. 121,516, 19.12.17. (Appl. 18,815/17.)

THE producer is provided with a vertical shaft, *l*, down which the fuel is fed and at the bottom of which are the fire-bars, *f*². The producer-gas rises into a collecting chamber, *f*, and then passes through



nostrils, *e*², in the concave roof, *e*, into a combustion chamber, *d*. Secondary air, preheated by passage through zig-zag channels in the furnace structure, is also led into this chamber from ports, *d*³, *d*⁴, close to the nostrils. The producer-gas is burned and the hot products pass into the boiler flue through a short piece of pipe, *a*, lined with fire-bricks.—T. F. E. R.

Gas washing and collecting apparatus. H. Hermansen, Baybridge, Assignor to The Sandusky Cement Co., Cleveland, Ohio. U.S. Pat. 1,283,763, 5.11.18. Appl., 28.12.16.

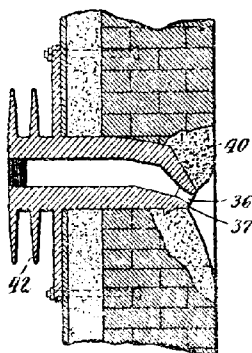
THE washing chamber is divided by a horizontal partition into two compartments. Gas is supplied to the top compartment by a central pipe and passes into the lower compartment through an annular series of pipes depending from the partition. In each pipe the gas is subjected to a small spray of washing fluid supplied by vertical pipes from outside the chamber. The fluid and gas pass together into a separator tank, after which the gas passes forward and the fluid is re-circulated to the sprays by means of a pump.—T. F. E. R.

Liquid fuel; Apparatus for burning — R. E. Griffith, Chicago, Ill. U.S. Pat. 1,284,657, 12.11.18. Appl., 1.3.15.

A MIXING chamber and an air chamber are separated by a perforated wall, and liquid fuel and air are drawn into the mixing chamber at the inner side of the perforated wall. The fuel is heated by a steam pipe passing through the fuel pipe, and connected with an apertured tube leading from the mixing chamber. The flow of steam draws the air and fuel into the mixing chamber and the mixture of fuel, air, and steam then passes through the apertured tube to the combustion chamber. The products of combustion pass through a flue enclosing the supply pipe for the combustible mixture.—W. F. F.

Burning explosive mixtures; Apparatus for —. Surface Combustion Co., Long Island City, N.Y., Assignees of G. E. Richardson, New York, W. B. Eddison, Irvington, N.Y., and H. L. Read, New York. Eng. Pat. 112,011, 1.11.17. (Appl. 15,938/17.) Int. Conv., 23.11.16.

FURNACES heated by the burning of explosive gaseous mixtures are provided with a special nozzle (see fig.) for introducing the mixture. This nozzle is made of a good heat conductor, e.g. cast iron, and tapers to the short discharge passage, 36, which has parallel sides. The gaseous mixture issues in a slanting downward direction, and im-



pinges on a granular bed of refractory material, where it spreads out and is burned. The mixture is supplied at a pressure such that it enters the furnace at a rate greater than its rate of flame propagation. The nozzle is almost completely protected from the heat by refractory cement, 40, but to prevent the incandescent cement coming into contact with the issuing stream a small area, 37, of the nozzle is left exposed and by conducting heat away prevents the issuing gas being raised to its ignition point and thus prevents the phenomenon of "back creeping" which the otherwise gradual heating up of the nozzle would cause. Heat-dissipating fins are fixed at 42, or the nozzle may be water-cooled.—T. F. E. R.

Hydrocarbon oils; Method of and apparatus for treating —. E. A. Johnson, Woodhaven, and W. Snodgrass, Brooklyn, N.Y. U.S. Pat. 1,283,202, 29.10.18. Appl., 17.1.17.

A NUMBER of parallel stills are placed in the combustion chamber of a furnace, each still consisting of an upper and a lower section connected by a number of vertical tubes. Oil is passed upwards through the stills in the form of hollow columns, both the interior and exterior of the columns being heated. The vapours generated are led to an atmospheric condenser to be partially condensed by radiation; the partially condensed vapours are then allowed to expand and finally condensed by liquid cooling.—L. A. C.

Heavier hydrocarbons; Process for the extraction of lighter hydrocarbons from — and especially of gasoline and another product from kerosene. F. A. Howard, Niagara Falls, N.Y. U.S. Pat. 1,284,687, 12.11.18. Appl., 25.1.18.

A MIXTURE of equal volumes of heavy hydrocarbon and cold water is heated in a still so that the temperature of the vapour is not above 98° C. The distillate of lighter hydrocarbons is condensed.

—W. F. F.

Oil still. O. C. Swan, Denver, Colo., Assignor to The Swan Process Oil Co. U.S. Pat. 1,284,945, 12.11.18. Appl., 28.4.17.

AN oil still, comprising an oil-heating chamber surmounted by a foam chamber, is provided with a dome-shaped double-walled vapour chamber above the foam chamber. The whole still is contained within a single vertical casing. A steam jacket is provided round the foam chamber, and steam is also circulated through the space between the double walls of the dome to superheat the vapour in the latter. The vapour is withdrawn through a central opening at the top, extending through the steam jacket.—W. F. F.

Gas-producers; Feeding mechanism for —. C. W. Lummis, Assignor to Morgan Construction Co., Worcester, Mass. Reissue 14,548, 12.11.18, of U.S. Pat. 1,270,963, 2.7.18. Appl., 28.9.18.

See this J., 1918, 539 A.

Carbon and method of recovering same from the waste product of oil-cracking. R. D. Pike, San Francisco, Cal. U.S. Pat. 1,285,363, 19.11.18. Appl., 25.7.16.

See Eng. Pat. 102,645 of 1916; this J., 1917, 127.

Washing coal, etc. Eng. Pat. 121,512. See I.

Oil from shale, etc. U.S. Pat. 1,283,000. See IIB.

Recovering cyanides. Eng. Pat. 120,759. See VII.

Nitric oxide in internal combustion engines. U.S. Pat. 1,283,117. See VII.

Clarifying oil. U.S. Pat. 1,284,750. See XII.

IIB.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Lignites; Carbonisation of —. E. Stansfield and R. E. Gilmore. Trans. Roy. Soc. Canada, 1917—18, [iii], 11, 85—100.

LABORATORY tests were carried out on a sample of lignite having gross calorific value 4260 cals., moisture 31.8%, ash 5.2%, volatile matter 28.9%, fixed carbon 34.1%; the calorific value of the dried lignite was 6200 cals. In tests carried out between 200° and 700° C., it was found that loss of volatile matter was slight up to 300° C., increased rapidly up to 600° C., and by 700° C. was practically complete. The calorific value of the residue increased to a maximum (7530 cals.) at 550°—600° C. and then decreased. Adopting slow carbonisation the results obtained were similar to the above, except that for any given final temperature the loss of volatile matter was less than with more rapid carbonisation. A series of vacuum carbonisations (25 mm.) was also carried out; in these the amount of volatile matter driven off was greater than at ordinary pressures; the calorific value of the residue was the same as when working at normal pressures at 350° C. (6920 cals.); above that temperature it was less (e.g. 7365 at 600° C., the highest value recorded in this series). When steam was passed through the retort the results were similar to those in the previous tests up to about 450° C.; above that temperature variable results were obtained, and it is concluded that this is the maximum which should be used under these conditions;

the calorific value of the residue was in all cases slightly lower than in the vacuum series, the maximum obtained (at 550° C.) being 7285 cal. Tests under pressure gave results closely resembling those of the vacuum series; the calorific values of the residues were higher than in any other series, reaching a maximum of 7640 cal. at 550° C. When the lignite was dried before carbonisation, the residues obtained had very high calorific values. The hot carbonisation residue is highly inflammable and gains in weight on standing; thus a sample kept in a stoppered tube gained 2.2% in 26 days, whilst the calorific value fell by 3.8%. The losses in calorific value appeared to be greater than could be accounted for by occlusion of air or absorption of moisture. It is concluded that a temperature about 600° C. is the most suitable for carbonisation. The by-products are to be examined later.

PATENTS.

Coal-distilling apparatus. Oil Extractors, Ltd., London, and F. Lamplough, Feltham. Eng. Pat. 121,496, 16.10.17. (Appl. 14,907/17.)

THE coal is fed by two hermetically sealed worm conveyors into inclined retorts of oval cross-section, set so that the long diameter of the oval is vertical. Excess coal is returned to the hopper from the delivery end of the conveyor by another worm conveyor. The hot products of distillation pass into an expansion chamber and two off-take pipes lead them through two vertical tubular boilers, fixed one above the other. When the steam pressure in the top boiler reaches a given value, water is forced out at the bottom through a connecting pipe into the top of the lower boiler, and the water displaced from this boiler passes back to an overhead feed tank, the height of which determines the maximum steam pressure. After leaving the boilers the gases undergo the usual purification processes. The steam after passing through superheaters fixed in the retort setting passes into the bottom of each retort. Each retort is provided with a mechanical stirrer which extends the whole length.

—T. F. E. R.

Oil; Apparatus for recovering — from oil-shale and other carbonaceous materials. Process for distilling carbonaceous materials. G. W. Wallace, Assignor to Wallace Coke, Oil and By-Products Co., East St. Louis, Ill. U.S. Pats. 1,283,000 and 1,283,001, 29.10.18. Appl., 8.2 and 26.3.18.

SOLID carbonaceous material is heated out of contact with air, liquids, gases, etc., other than those generated during the distillation, in a vertical retort, the walls of which taper from the lower to the upper end. The top and bottom of the retort are closed and within the retort is a vertical perforated tubular take-off duct which passes through the bottom of the retort and through which vapours and liquids generated during the distillation are withdrawn under reduced pressure. Steam can be introduced through a device fitted to the bottom of the retort.—L. A. C.

Incandescence electric lamps; Leading-in wires, or conductors, of —, high vacuum apparatus, and the like. F. Hoge, Zug, Switzerland. Eng. Pat. 121,173, 4.12.17. (Appl. 17,941/17.)

THE leading-in wires or conductors of incandescence lamps are made from a wire of iron, steel, or alloy, coated with a paste of powdered glass mixed with tungsten, tungsten oxide, or a metal or oxide of the same group, the whole being heated to form an adherent coating on the wire.—B. N.

Incandescence [electric] lamps; Manufacture of —. F. W. Gill, Arlington, N.J., Assignor to General Electric Co. U.S. Pat. 1,284,648, 12.11.18. Appl., 29.6.15.

SEE Eng. Pat. 11,544 of 1915; this J., 1916, 959.

III.—TAR AND TAR PRODUCTS.

Coal-tar industry; Methods of analysis used in the —. III. Heavy and middle oils. J. M. Weiss. J. Ind. Eng. Chem., 1918, 10, 911—916. (See this J., 1918, 648, 728 A.)

Heavy oil tests. Water, sp. gr., and matter insoluble in benzene, are determined as already described (*loc. cit.*). A retort distillation is also made, fractions being collected at 210°, 235°, 270°, 315°, and 355° C., and the sp. gr. of these is determined. The coke remaining after the retort has been heated to redness is weighed. Tar acids are determined in the distillate either by noting the decrease in volume of the distillate when this is shaken with sodium hydroxide solution, or by acidifying the alkaline extracts and measuring the liberated tar acids. The sample is submitted to a Hempel distillation and the refractive indices of the fractions determined. Tar bases are determined by extracting the distillate with sulphuric acid. The sulphonation test of the fractions is made in a graduated centrifuge bottle and the volume of the unsulphonated residue noted. To determine "dry salts," the oil, after extraction of the tar acids, is cooled at 4-5° C., and the separated solids are collected, dried between filter-paper, and weighed. The limpid point of the oil is determined by cooling it until crystals appear and then raising the temperature until a point is reached at which all crystals disappear. *Middle oil tests.* These are the same as for heavy oils, but the coke test is omitted.—W. P. S.

Coal-tar industry; Methods of analysis used in the —. IV. Benzols and light oil. J. M. Weiss. J. Ind. Eng. Chem., 1918, 10, 1006—1012. (See this J., 1918, 648 A, 728 A.)

Benzols. The sp. gr. is determined by methods mentioned previously (*loc. cit.*); the distillation test is made under prescribed conditions, as is also the sulphuric acid wash test. Carbon bisulphide is determined by conversion into xanthate, which is titrated with copper sulphate solution. Sulphonation is employed for the determination of paraffins, whilst hydrogen sulphide and sulphur dioxide are determined by extraction with sodium hydroxide solution and subsequent oxidation with bromine. The solidifying pt. is also determined. *Light oils.* The material is tested for water, sp. gr., tar acids, and tar bases as already described for heavy oils (see preceding abstract). Other special tests comprise distillation, tar acids by contraction and liberation method, determination of crude naphthalene, and a distillation method for the determination of benzene and toluene.—W. P. S.

Phenol, o-cresol, m-cresol, and p-cresol; Freezing points of mixtures of —. H. M. Dawson and C. A. Mountford. Chem. Soc. Trans., 1918, 113, 923—935.

THE freezing point curves of the six series of binary mixtures, which may be derived from this group of substances, have been determined by observation of the lowest temperatures at which the various mixtures undergo complete liquefaction. Weighed quantities of the carefully purified and thoroughly dried components of the mixture under

examination were sealed up in glass tubes, the contents melted and then partially solidified by cooling. The tubes were then made to rotate in a water bath of slowly rising temperature, and the temperature at which the last crystals disappeared was registered as that at which freezing would begin in the absence of supercooling effects. The results obtained, which differ very considerably from those recently recorded by Fox and Barker (this J., 1918, 268 T), show that definite chemical compounds are formed in the case of five out of the six pairs of substances. Such combination is not definitely excluded in the apparently exceptional case (phenol and *o*-cresol), although the freezing point observations suggest that the curve system consists of only two branches. Comparison of the changes in the freezing point which are produced when three of the substances of the group are severally added in equivalent quantities to the fourth in the capacity of solvent, shows considerable diversity in the behaviour of these chemically closely related substances. It is probable that these differences are to be explained in terms of the formation of solid solutions. (See also following abstract.)—H. M. D.

Phenol and the three isomeric cresols; Estimation of — in mixtures of these substances. H. M. Dawson and C. A. Mountford. Chem. Soc. Trans., 1918, 113, 935–944.

In virtue of their behaviour on fractional distillation, the eleven possible groups of mixtures which may be derived from the four substances in question may be reduced to four which are of practical importance, namely, (1) phenol and *o*-cresol, (2) *m*-cresol and *p*-cresol, (3) the three cresols, (4) all four components. It is shown that the determination of the composition of each of these groups of mixtures may be conveniently effected by freezing point observations. The value of a freezing point curve for this purpose is determined by its steepness and by its length. In the case of mixtures of phenol and *o*-cresol, the measurement is made with reference to the phenol curve. The unknown mixture, X, is mixed with a definite quantity of standard phenol and the freezing point of the resulting mixture, Y, is determined. From the curve the composition of Y is read off and the composition of X follows by a simple calculation. Mixtures of *m*-cresol and *p*-cresol may be similarly analysed by making use of the freezing point curve for *p*-cresol. According to an alternative method, the mixture is added to standard phenol to give a ternary mixture containing 60–70% of phenol, and the freezing point of this is determined. From this the ratio of *m*- to *p*-cresol in the mixture can be deduced (see Table III. below). In the case of ternary mixtures of the three cresols, two freezing point measurements are required. The method depends on the fact that the freezing point of *p*-cresol is lowered to the same extent by *o*-cresol and *m*-cresol and on the further observation that the freezing point of *o*-cresol is depressed to very nearly the same extent by *m*-cresol and *p*-cresol. The proportion of *p*-cresol and *o*-cresol in the unknown mixture can thus be determined and the *m*-cresol is obtained by difference. In applying these methods to the estimation of the composition of a quaternary mixture it is necessary to subject the mixture to a preliminary fractional distillation. A known proportion of *o*-cresol should be added to the mixture and the resulting liquid subjected to careful fractional distillation, when it is readily separated into two fractions: (a) phenol and *o*-cresol. (b) *o*-cresol, *m*-cresol, and *p*-cresol. The binary and the ternary fractions so obtained can then be examined by the methods already described. The curves used

correspond with the numbers in the following tables showing: (I) the freezing points of binary mixtures rich in phenol or in *o*-cresol respectively; (II) freezing points of *p*-cresol in admixture with *o*- or *m*-cresol or phenol; (III) freezing points of ternary mixtures of phenol and *m*- and *p*-cresol; (IV) freezing points of *o*-cresol in admixture with *m*- and *p*-cresol.

TABLE I.

Phenol, % by weight	100	95	90	85	80	75	70
Freezing pt., °C.	40.5	37.9	35.2	32.4	29.5	26.5	23.4
<i>o</i> -Cresol, % by weight	100	95	90	85	80	75	70
Freezing pt., °C.	80.45	29.0	27.6	26.25	24.95	23.7	22.6

TABLE II.

<i>p</i> -Cresol, %	100	95	90	85	80	75	70	65
Freezing pt., °C.	34.15	30.7	27.2	23.6	20.0	16.3	12.3	7.8

TABLE III.

Per cent. phenol in ternary mixture	Per cent. <i>m</i> -cresol in mixture of <i>m</i> - and <i>p</i> -cresol											
	0	10	20	30	40	50	60	70	80	90	100	
	° C	° C	° C	° C	° C	° C	° C	° C	° C	° C	° C	
60	9.5	10.5	11.6	12.7	13.8	15.0	16.4	17.8	19.3	20.8	22.6	
65	14.4	15.1	15.8	16.5	17.2	18.0	18.9	19.9	21.0	22.2	23.5	
70	19.0	19.5	20.1	20.7	21.4	22.1	22.9	23.8	24.8	25.9	27.9	

TABLE IV.

<i>o</i> -Cresol, %	100	95	90	85	80	75	70	65
Freezing pt., °C.	30.15	28.05	25.6	23.1	20.4	17.5	14.4	11.0

—H. M. D.

Phenols and sulphonic acids; Fusion of sodium hydroxide with several —. M. C. Boswell and J. V. Dickson. J. Amer. Chem. Soc., 1918, 40, 1786–1793.

WHEN sodium benzenesulphonate is fused with sodium hydroxide at 300°–350° C. in presence of air, a certain amount of oxygen is absorbed and free hydrogen is evolved. A double oxidation appears to proceed, the first stage by atmospheric oxygen, the second by water with hydrogen formation. If the fusion is carried out in absence of air, no hydrogen is formed. Experiments made on 100-grm. quantities of benzenesulphonate showed that, when the fusion was carried out in presence of air, the maximum yield of phenol was 90%, whilst when an atmosphere of nitrogen was used, the yield was 98%. It is suggested that it might be advantageous to carry out fusions on a manufacturing scale with exclusion of oxygen. In the case of sodium naphthalene- β -sulphonate fusions, hydrogen formation is prevented by excluding air, and it is probable that in this case also the yield of β -naphthol might be improved by excluding air during fusion. The dihydroxy- and trihydroxy-benzenes appear not to be formed during the benzenesulphonate fusion. Sodium hydroxide does not bring about the catalytic oxidation of these substances by water (compare page 72 A), except in the case of hydroxyquinol, which gives hydrogen even in absence of air. Sodium anthraquinone- β -sulphonate is also oxidised catalytically by caustic soda.—E. H. R.

Action of sodium hydroxide on carbon monoxide, etc. Boswell and Dickson. See VII.

PATENTS.

Nitro-compounds; Process of manufacturing —. L. W. Andrews, Chicago, Ill. U.S. Pat. 1,283,617, 5.11.18. Appl., 8.2.17. Renewed, 14.9.18.

A NITRATING mixture containing an acid amide is used for nitrating organic compounds.—L. A. C.

Aromatic hydrocarbons; Process for oxidising the side chains of —. Manufacture of phthalic anhydride, phthalic acid, benzoic acid, and naphthoquinones. (A) H. D. Gibbs, and (B) H. D. Gibbs, San Francisco, Cal., and C. Conover, Philadelphia, Pa. U.S. Pats. (A) 1,284,887 and (B) 1,284,888, 12.11.18. Appl., 22.9.16 and 12.5.17. (Dedicated to the public.)

SEE Eng. Pats. 119,517 and 119,518 of 1917; this J., 1918, 684 A.

Phthalic anhydride, phthalic acid, benzoic acid, and naphthoquinones; Manufacture of —. H. D. Gibbs, San Francisco, Cal., and C. Conover, Philadelphia, Pa. U.S. Pat. 1,285,117, 19.11.18. Appl., 17.2.17. (Dedicated to the public.)

SEE Eng. Pat. 119,518 of 1917; this J., 1918, 684 A.

Fractional distillation. Eng. Pat. 120,940. See I.

Coking pitch. U.S. Pat. 1,283,229. See IIA.

IV.—COLOURING MATTERS AND DYES.

PATENT.

Dyes; Method of making universal —. C. C. Huffman, Assignor to Sunbeam Chemical Co., Chicago, Ill. U.S. Pat. 1,283,519, 5.11.18. Appl., 1.4.18.

A VEGETABLE oil is mixed with the requisite quantity of saponifying agent, and before the reaction attains completion, a solution of an aniline dyestuff is added. The mixture is well agitated, and moulded into a large cake at about 50° C. Saponification is completed in the moulded cake, the reaction bringing the temperature up to about 80° C. in two hours, after which the cake gradually cools to room temperature, and is cut into slabs.—S. S. A.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cotton of different degrees of purification; Behaviour of — towards solutions of metallic salts. R. Haller. Chem.-Zeit., 1918, 42, 597—599.

REPRESENTATIVE samples of Indian, American, and Egyptian cotton were prepared in different stages of chemical purification, following the usual industrial bleaching process. The samples were treated at the ordinary temperature for 48 hours with solutions of aluminium sulphate, aluminium acetate, and lead acetate. The change in the percentage of metallic base in the solutions was then determined in order to have an approximate measure of the adsorption, and the quantity of metallic base fixed by the cotton after washing was determined by incineration. In some cases with aluminium sulphate and in all cases with aluminium acetate, a negative adsorption was observed, that is, the concentration of metallic base in solution was increased instead of decreased by the action of the cotton. Using aluminium acetate, the negative adsorption was smallest in the case of the raw fibre and became greater as the degree of purification was increased. Cotton which had been boiled with lime gave higher values than that which had been boiled with caustic soda. Negative adsorption was most pronounced in the case of Egyptian cotton. Using aluminium sulphate, positive adsorption was observed in all

cases with the raw cottons and with those which had been boiled with lime; on the other hand, the samples boiled with caustic soda, also those boiled first with lime and then with soda, and the fully bleached samples, all showed negative adsorption, increasing generally with the degree of purification. Lead acetate showed in all cases a large positive adsorption increasing with the purification of the cotton. The maximum adsorption in all cases, both positive and negative, appears to correspond with maximum purification of the cotton, which is attained by boiling first with lime and then with caustic soda, with a sour after each boll. Treatment with bleach liquor appears to decrease the purity of the cellulose, at any rate it lowers the adsorption values. An exceptionally large adsorption with lead acetate was shown by the raw cottons; no doubt, the ease of wetting by the various solutions plays a part. Adsorption does not necessarily run parallel with fixation of insoluble base in the fibre. In all the experiments with aluminium salts there was a fixation of alumina, even when negative adsorption values were recorded. In the experiments with lead acetate showing high positive adsorption, a large fixation was at the same time observed in the case of the raw cottons, and the appearance suggested that the lead oxide was combined with some of the non-cellulose constituents. After boiling, the amount of fixation of lead oxide became smaller with increasing purification of the cotton although the adsorption became more marked.—J. F. B.

PATENTS.

Paper; Manufacture of waterproof —. J. T. Croll, Glasgow. Eng. Pat. 121,318, 4.12.17. (Appl. 17,920/17.)

THE web of paper is passed direct from the delivery end of the paper-making machine through a bath of waterproofing material, such as a solution of wax. The paper is led into, through, and out of the bath by guide rolls and passes into a drying chamber in which it travels round a series of rolls while subjected to the action of currents of air produced by fans or by forced draught.—J. F. B.

Paper; Removing impregnating material from —. W. O. Gaynor, Assignor to M. Goodman, Chicago, Ill. U.S. Pat. 1,284,647, 12.11.18. Appl., 27.11.16.

THE impregnated paper is immersed in a liquid with which the impregnating material is freely miscible only when fused, and the liquid is heated directly to a temperature sufficient to fuse the impregnating material and to cause the convection currents to agitate the paper and diffuse the impregnating material throughout the liquid. The liquid containing the dissolved impregnating material is then withdrawn.—J. F. B.

Paper-machine. Paper-screen. A. J. Haug, Assignor to Improved Paper Machinery Co., Nashua, N.H. U.S. Pats. (A) 1,284,668 and (B) 1,284,669, 12.11.18. Appl., 13.7.16 and 4.1.17.

(A) A DEVICE for screening paper stock in stages comprises a screen drum, a central cylindrical fixed core having a semi-cylindrical chamber beneath it, end heads for the drum journaled about the core, and means for rotating the drum. An inlet passage for the stock enters the drum through one end of the core and has a lateral feed delivery-opening extending for a portion only of the length of the drum and adapted to deliver stock on the descending side of the drum. Stock-lifting plates are secured to the interior of the drum, the stock being screened and the unscreened residue lifted and dropped by the lifting blades on the ascending

movement of the latter. Means are provided for diluting the thickened residue and for re-screening the latter, including conveying means comprising a passage arranged helically around and beneath the core in the semi-cylindrical chamber and having an entrance to receive the diluted tailings from the preceding screening, together with deflecting walls to deflect tailings thereto, and an exit opening at a point axially advanced in the length of the drum, from which the tailings are delivered again to the descending side of the drum. Arrangements may be made for repeating the screening and discharging action as many times as desired before the final tailings are withdrawn. (B) A screen for paper stock has an exterior foraminous covering and a series of supports for the same with means for uniting the supports to form a skeleton frame. Interchangeable members are carried by the supports, each comprising segmental separated units and providing one assembled and main circumferential support for the foraminous covering. The units may be replaced without dismantling the skeleton frame.—J. F. B.

Wood pulp for nitrating or similar purposes; Process of refining — V. Drewsen, Brooklyn, Assignor to West Virginia Pulp and Paper Co., New York. U.S. Pats. (A) 1,283,113 and (B) 1,283,114, 29.10.18. Appl., 24.1.18 and 19.6.18.

(A) Soda or sulphate wood pulp is partially bleached by treatment for several hours with chlorine water equivalent to 2–8% of chlorine on the dry weight of the pulp. The partially bleached, yellow pulp is boiled under pressure for several hours with a solution of sodium carbonate to dissolve the colouring matter and other "converted products" and to reduce the matters soluble in caustic potash to considerably below 7%. (B) Sulphite wood pulp is thoroughly bleached by treating for 4–8 hours with bleaching powder solution. The bleached pulp is washed, boiled for several hours under pressure with caustic soda solution to dissolve the oxycellulose and hydrocellulose, and then washed and bleached again, while keeping the matters soluble in caustic potash below 7%.—J. F. B.

Sulphite-cellulose liquors; Process of treating waste — [for production of alcohol]. R. H. McKee, New York. U.S. Pats. (A) 1,284,739 and (B) 1,284,740, 12.11.18. Appl., 22.6.17 and 23.1.18.

(A) In the production of alcohol by the fermentation of waste sulphite liquor, the liquor containing sulphites is treated with a soluble barium compound under oxidising conditions, whereby the injurious sulphur compounds are precipitated as barium sulphate. Alternatively, the liquor may be purified by treatment with barium carbonate under oxidising conditions, thereby producing a sludge containing barium sulphate; the sludge is separated, the liquor is fermented and distilled, and the sludge is heated in a furnace under reducing conditions to form barium sulphide, which is converted into barium carbonate by treating it under pressure with the carbon dioxide evolved from the fermentation vats. Hydrogen sulphide is formed at the same time. (B) The liquor is treated with barium sulphide under oxidising conditions, thereby producing barium sulphate and eliminating injurious sulphur compounds; the barium sulphide is then regenerated as described above.—J. F. B.

Bamboo and kindred material; Apparatus for preparing — for pulp extraction. J. L. Jardine, Penicuik, and I. T. Nelson, Edinburgh. Eng. Pat. 121,679, 9.3.18. (Appl. 4151/18.)

Dehydrating textiles. Eng. Pat. 121,394. See I.

Dyeing. U.S. Pat. 1,283,296. See VI.

Fireproofing textiles. Ger. Pat. 306,600. See IX.

Dextrin. U.S. Pats. 1,283,839 and 1,284,120. See XVII.

Solvent [for cellulose esters]. U.S. Pat. 1,283,183. See XX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Cotton and metallic salts. Haller. See V.

PATENTS.

Dyeing, bleaching or like treatment of cops; Process and apparatus for —. A. Clavel, Basle, Assignee of W. Resch, Binningen, Switzerland. Eng. Pat. 117,630, 16.7.18. (Appl. 11,665/18.) Int. Conv., 20.7.17.

THE cops, on paper tubes, are packed and pressed together in layers in a container. To ensure that the outside cops in the container maintain the proper position, there is inserted, in the end of the paper tube of the cop, a short stopper prior to the packing operation. This stopper forms a retainer for the yarn and a protection for the end of the cop tube. The container has perforated ends and is clamped tightly between two transverse filter chambers in a vat, so that the liquor is circulated longitudinally through the cops.—L. L. L.

Dyeing and like treatment of textiles; Machinery for —. F. F. Larivel, Bath. Eng. Pat. 120,848, 9.4.18. (Appl. 6017/18.)

THE machine comprises a perforated cage or frame carrying the fibre-bearing sticks, the whole being immersed in a dye-vat. The cage or frame is given a to and fro motion, whilst immersed in the vat liquor, and then an up and down motion, the speed of the up motion being different from that of the down. The periods of the respective motions are predetermined for different classes of goods.—L. L. L.

Dyeing, washing, scouring, sizing, bleaching, and mercerising yarn in hank form; Machines for —. J. S. and S. S. Lord, Manchester. Eng. Pat. 121,075, 27.4.18. (Appl. 7109/18.)

THE machine comprises a horizontal rotating central shaft, with one or more sets of radial arms which can be rotated intermittently around the shaft. Each arm carries a pair of horizontal projecting rotary members for holding the hanks. The inner rotary members can be brought into and out of frictional contact with rollers attached to the central shaft, and are thereby frictionally rotated during treatment in the tank, and also act as squeezing rollers to aid penetration of the material and to remove superfluous liquor. During treatment in the bath one radial arm is in position for removal of the treated material and recharging with fresh material.—L. L. L.

Dyeing; Direct — J. Puring, Assignor to Robeson Process Co., New York. U.S. Pat. 1,283,296, 29.10.18. Appl., 1.5.17.

To obtain a composition for dyeing animal fibres, a thick solution of the characteristic solids of waste sulphite liquor is mixed with a small amount of naphthylamine, and a small amount of nitric acid

is added. Alternatively, a dry pulverulent material may be prepared, containing the solid matters of waste sulphite liquor, an aromatic cyclic substance, and the products of the reaction of nitric acid on the mixture of the two.—J. F. B.

Dyeing machines. Eng. Pat. 121,199. See I.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; New method for the synthesis of —. H. Hampel and R. Steinau. Chem.-Zeit., 1918, 42, 594.

THE method consists in heating together iron, ammonium chloride, and nitrogen at 300° C. under 50 atm. pressure. The reaction proceeds according to the equation: $3\text{Fe} + 6\text{NH}_4\text{Cl} + 2\text{N} = 3\text{FeCl}_2 + 8\text{NH}_3$. The gaseous mixture obtained contains 98 to 99% NH_3 ; of this, 75% comes from the ammonium chloride and 23 to 24% from the nitrogen. The ammonia may, subsequently, be passed into the ferrous chloride solution whereby ammonium chloride is again formed together with ferrous hydroxide which may be reduced to the metallic state and used again.—W. P. S.

Water-glass manufacture. O. Maetz. Chem.-Zeit., 1918, 42, 569—570, 582—583.

IN the manufacture of sodium silicate Glauber salt is now generally used in place of sodium carbonate on account of its lower price, although a greater weight has to be used in addition to a quantity of coal as a reducing agent, whilst it has a more destructive action on the furnace walls than carbonate. The materials are used in the proportion of 100 parts of sand, 75 of Glauber salt, and 8 of coal. The finely ground mixture is fused at about 1500° C. in a tank furnace constructed of firebrick, the bottom being cooled externally by air-ducts connected with the chimney. The furnace proper communicates with a second compartment by means of a hole at a distance from the bottom one-quarter the depth of the charge. The fused glass falling to the bottom of the furnace, flows into the second compartment, which may be separately heated to keep the water-glass molten, and is thence discharged into an iron vessel filled with water to cool it. The furnaces are fired with producer gas and may be worked on the recuperative or the regenerative system, the former being suitable for small plant with a daily output of 1500—5000 kilos., whilst for larger installations, up to 20,000 kilos. per day, the regenerative system is better. The solidified water-glass is broken up into fairly small particles, usually by means of hammers. (It is not now generally ground in a ball mill as the finely divided particles ball together during the extraction process, and then only dissolve with difficulty.) The broken product is then transferred to the dissolving drums, in which it is treated with steam at about 5 atmospheres pressure, whilst the drums rotate at about 6 revs. per min., the solution process taking about 6 hrs. The capacity of the drums should be in the proportion of 1 litre to 1 kilo. of dissolved glass, so that, the sp. gr. of the water-glass being 1.5, the drum is $\frac{1}{2}$ full at the end of the process. A convenient capacity is 6000 litres. For each kilo. of solid glass about $\frac{1}{4}$ —2 kilos. of steam is used. When solution is complete the product is run off into settling tanks and, after the mud has settled, passed through a filter-press. The clear water-glass so obtained generally has to be concentrated, this

being carried out in a closed steam-jacketed vessel connected to a vacuum pump, the solution being stirred during concentration to obtain a homogeneous product. (See also Caven, this J., 1918, 63 T.)—E. H. R.

Sodium hydroxide; Fusion of — with some inorganic salts. M. C. Boswell and J. V. Dickson. J. Amer. Chem. Soc., 1918, 40, 1773—1779.

WHEN sodium arsenite or ferrous sulphate is fused at 300°—400° C. with sodium hydroxide, hydrogen is evolved and the salt is oxidised. The volume of hydrogen evolved is equivalent to the oxygen taken up by the salt, the reaction consisting in the decomposition of water. Stannous chloride and vanadium sulphate also give much hydrogen when fused with sodium hydroxide. With cerous and uranous sulphates small amounts of hydrogen are formed, but with sodium sulphite and sodium nitrite there is practically no action. (See also J. Chem. Soc., Feb., 1919.)—E. H. R.

Sodium hydroxide; Action of — on carbon monoxide, sodium formate, and sodium oxalate. M. C. Boswell and J. V. Dickson. J. Amer. Chem. Soc., 1918, 40, 1779—1786.

AT 410°—430° C. carbon monoxide in contact with fused sodium hydroxide is oxidised to carbon dioxide, an equivalent amount of hydrogen being also produced. Sodium formate when fused with sodium hydroxide at 275° C., a temperature much below its normal decomposition point, gives a quantitative yield of carbon dioxide, an equivalent amount of hydrogen being again formed. Sodium oxalate at 290° C. is similarly oxidised. The effective oxidising agent is water present in the fusion, the reaction being catalysed by the sodium hydroxide. An explanation can now be offered of the process of Ger. Pat. 161,512 (this J., 1904, 911, and 1905, 150) according to which, by the addition of 5% of sodium hydroxide to sodium formate, the latter can be transformed into technically pure oxalate at a temperature below its melting point. The alkali here brings about the oxidation of the formate to oxalate by water at a temperature below that at which the velocity of oxidation to carbonate becomes appreciable. Similarly it is considered that alkali fusions involving the replacement of the carboxyl group by hydrogen, as in the formation of benzene from sodium benzoate, are brought about by simultaneous oxidation and reduction by the elements of water.—E. H. R.

Alkali hypochlorite solution; Determination of free alkali and alkali carbonate in —. M. Philibert. J. Pharm. Chim., 1918, 18, 260—272.

TEN c.c. of the sample is treated with 5 c.c. of 20% potassium iodide solution and 30 c.c. (an excess) of N/10 hydrochloric acid, and the liberated iodine is titrated with N/10 thiosulphate solution; potassium iodide-iodate solution is then added and the iodine again titrated with thiosulphate solution. The latter titration corresponds with the total free alkalinity of the sample. Another portion of 20 c.c. of the sample is treated with a quantity of N/10 barium hydroxide solution equal to the total alkalinity of the sample, barium chloride solution is added, the mixture diluted to 100 c.c., filtered, and the alkalinity of the filtrate determined as described above. The difference between this alkalinity (free alkali) and the total alkalinity is a measure of the carbonate alkalinity. If free alkali is not present, the barium precipitation will give the quantities of alkali carbonate and bicarbonate in the solution.—W. P. S.

Hypophosphites and phosphites; Iodometric determination of —. Boyer and Bauzil. J. Pharm. Chim., 1918, 18, 321–334.

In acid solution, hypophosphites are oxidised to phosphites by iodine; if the solution is then rendered alkaline, the reaction proceeds a stage further and the phosphite is converted into phosphate. **Hypophosphites.** Ten c.c. of a 1% solution of the hypophosphite (salts insoluble in water may be dissolved in dilute sulphuric acid) is treated in a stoppered flask with 10 c.c. of 25% sulphuric acid and 30 c.c. of N/10 iodine solution; after the mixture has stood for 10 hrs. in a dark place, the excess of iodine is titrated with N/10 thiosulphate solution. Each c.c. of N/10 iodine solution is equivalent to 0.00328 grm. of H_3PO_3 . **Phosphites.** Ten c.c. of a 1% solution of the salt is treated with 10 c.c. of 5% sodium bicarbonate solution and 20 c.c. of N/10 iodine solution; after 2 hrs., 10 c.c. of 10% acetic acid is added and the excess of iodine titrated. Each c.c. of N/10 iodine solution corresponds with 0.00407 grm. of H_3PO_3 . The method is applicable to mixtures of hypophosphites and phosphites.—W. P. S.

Silica; The "swelling" of —. K. Hebbeler. Chem.-Zeit., 1918, 42, 593–504.

WHEN 2 grms. of kieselguhr is shaken with water in a 250 c.c. graduated cylinder and then allowed to settle for 24 hrs., the silicious sediment will occupy a volume of from 8 to 18 c.c.; if the clear water is then drawn off and replaced by calcium hydroxide solution, which is, in turn, drawn off and a fresh quantity added every day, the volume of the sediment will increase gradually until after 14 days it will measure from 68 to 196 c.c., according to the grade of kieselguhr employed. This increase in the volume of the sediment is not due to increase in the size of the silica skeletons constituting the substance, but is caused by the separation of calcium hydroxide which is occluded in the mass; the supernatant liquid contains less calcium hydroxide after it is shaken with the kieselguhr, and the greater part of the precipitated calcium hydroxide may be removed by extracting the mass with water. A small portion is precipitated as carbonate and this may be removed by means of water containing carbon dioxide; the volume of the kieselguhr then diminishes to that observed originally. There is no formation of calcium silicate and the phenomenon appears to be purely physical.—W. P. S.

Range of existence of substances, kinetic analysis, and the estimation of vapour pressures from reaction velocities. M. Trautz. Z. anorg. Chem., 1918, 104, 169–210.

A THEORETICAL paper in which the author discusses a number of chemical reactions, mostly gas or vapour reactions, in terms of his theory of reaction velocities. The formation of nitrosyl chloride and nickel-carbonyl, the combustion of hydrogen, and the decomposition of ammonia, phosphine, and arsine are fully discussed. It is shown that the vapour pressure and boiling point of nickel can be calculated from the velocity of formation of nickel-carbonyl and its temperature coefficient. There is a close relationship between the energy required to bring about the decomposition of a substance (the "heat of activation") and the wave-length of the light which will induce the same reaction photochemically. (See also J. Chem. Soc., Feb., 1919.) —E. H. R.

Ammonia recovery. Smith. See IIA.

Nitre-cake in superphosphate manufacture. Shutt and Wright. See XVI.

Acetic acid from maize cobs. La Forge and Hudson. See XVII.

Zirconium phosphate. Steiger. See XXIII.

PATENTS.

Nitric acid; Manufacture of —. B. Dawson, Bradford, Eng. Pat. 120,869, 4.9.18. (Appl. 14,359/18.)

In the absorption of nitrous gases by projecting sprays of water or weak acid from the bottom of an unobstructed tower by means of air jets, each jet is provided with a funnel-shaped attachment. The wide end of the funnel projects above the level of the liquid in the tower, while the apex surrounds, and is attached to, the jet at a point some distance below the water level. Access of the liquid to the interior of the funnel is obtained by means of holes near the apex and just below the tip of the jet. By means of this device efficient spraying can be effected notwithstanding variations in the level of liquid in the tower.—W. E. F. P.

Nitric acid; Process of concentrating —. B. Thomas, Seattle, Wash. U.S. Pat. 1,283,598, 5.11.18. Appl., 24.7.17.

NITROUS gases are dissolved under pressure, and the lower oxides of nitrogen are converted into nitric acid by electrolysis.—S. S. A.

Nitric oxides; Production of — in internal-combustion engines. R. Dräwe, Assignor to Ehrhardt und Schmer G.m.b.H., Saarbrücken, Germany. U.S. Pat. 1,283,112, 29.10.18. Appl., 26.11.15.

In the production of nitric oxide in internal-combustion engines, the combustible mixture, together with an excess of gaseous fluid which is injected into the combustible mixture in order to mix the particles thoroughly together, is preheated to a high temperature by means of the exhaust gases, in order to increase the amount of heat of the mixture in proportion to its volume. The high temperature of the mixture is maintained up to the end of the compression period to effect the formation of nitric oxide, combustion being completed when the highest temperature is reached. A rapid fall of temperature is effected immediately thereafter, to diminish the decomposition of the nitric oxide formed.—J. F. B.

Sulphuric acid; Process and apparatus for producing —. H. V. Welch, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,284,166, 5.11.18. Appl., 22.11.16.

In a mixture of sulphur dioxide, oxygen, oxides of nitrogen, and water, in the form of gases containing non-gaseous particles, the reactions are accelerated by producing agglomeration and precipitation of liquid particles by the successive action of electrical fields of sufficient intensity. Oxides of nitrogen, and fumes of sulphuric and nitrosyl-sulphuric acids are recovered from the effluent of the chamber process by passing the waste gases through a chamber fitted with electrodes, between which a high potential difference is maintained. The electric discharge produced precipitates the fumes on the collecting electrodes, from which they are recovered by washing the electrodes with concentrated sulphuric acid.—S. S. A.

Sulphuric acid; Contact process and apparatus for producing — H. V. Welch, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,284,167, 5.11.18. Appl., 22.11.16.

SULPHUR-BEARING material is burned to produce gases containing sulphur dioxide. The gases are freed from suspended matter by subjecting them to a high-tension electric discharge, then mixed with hot air and passed over a substantially permanent catalyst of the ferric oxide type, maintained at the proper temperature. An aqueous liquid spray is introduced into the treated gases to dissolve the sulphur trioxide, forming a sulphuric acid mist, the particles of which are agglomerated and precipitated by the action of a high-tension electrical field.—S. S. A.

Sulphuric acid manufacture. L. Bradley, East Orange, N.J., Assignor to Research Corporation, New York. U.S. Pat. 1,284,175, 5.11.18. Appl., 24.2.17.

AN apparatus for the electrical precipitation of solid particles from gases containing sulphur dioxide and sulphuric acid, consists of two electrical precipitators arranged in series, in the line of the flow of the gas, and between them a heat interchanger, by means of which the precipitation may be carried out either above or below the condensing temperature of sulphuric acid.—S. S. A.

Sulphuric acid manufacture. L. Bradley, East Orange, N.J., Assignor to Research Corporation, New York. U.S. Pat. 1,284,176, 5.11.18. Appl., 25.8.17.

THE burner gases are freed from dust in an electrical precipitator maintained at a sufficiently high temperature to avoid deposition of sulphuric acid. They then pass through a Glover tower in which partial oxidation of the sulphur dioxide is effected, and are afterwards cooled to form a sulphuric acid mist, which is removed in a second electrical precipitator.—S. S. A.

Oxychloride of carbon and other substances; Catalytic apparatus for the production of — J. L. Darrasse, Paris. Eng. Pat. 115,422, 9.4.18. (Appl. 6062/18.) Int. Conv., 23.4.17.

IN the preparation of carbon oxychloride (phosgene) from carbon monoxide and chlorine by catalysis, a leaden U-tube, elliptical in cross-section and having restricted inlet and outlet extension pieces, is employed as container for the catalyst. The dimensions of the tube are: height, not less than 900 mm.; major and minor axis of elliptical cross-section, 180 and 100 mm., respectively.—W. E. F. P.

Thorium; Process for separating — from other rare earths and for the manufacture of thorium nitrate. J. V. Clarke, Plumstead, and W. A. Clarke, London. Eng. Pat. 120,748, 21.9.17. (Appl. 13,617/17.)

THORIUM is precipitated from acid solutions as oxide or/and peroxide by the addition of an oxidising agent such as a permanganate or hydrogen peroxide. For example, the solution obtained by digesting 20 parts by weight of monazite sand with 50 parts of concentrated sulphuric acid at 180°–200° C., adding the pasty mass to 200 parts of cold water, and allowing the insoluble matter to settle, is treated with a weak solution of alkali permanganate until permanently coloured, and slowly heated to about 90° C., when thorium oxide or/and peroxide is precipitated. After being washed free from cerium and acid, the precipitate is dissolved

in nitric acid (50%), and the solution evaporated, preferably *in vacuo*, to produce crystallised thorium nitrate.—W. E. F. P.

Cyanides contained in the by-products obtained in gas works; Recovery and utilisation of the — H. Baker, Barrow-in-Furness, Lancs. Eng. Pat. 120,759, 16.11.17. (Appl. 16,879/17.)

WASTE or effluent liquor from ammonia-recovery plants is concentrated in the presence of alkali carbonate, whereby certain of the cyanides present are decomposed with the production of ammonia which is recovered; the cyanides remaining in solution are precipitated by the addition of a metal compound other than a mercury salt. The precipitated cyanides are filtered off and decomposed by carbonisation, etc., to produce ammonia, in which case the alkaline filtrate is employed for liberating ammonia from fresh ammoniacal liquor; or the liquid containing the precipitated cyanides is evaporated to dryness and the residue decomposed by heat. Spent oxide is boiled with alkali carbonate and the solution, after concentration, is treated with a compound of a metal other than mercury to produce insoluble cyanides.—W. E. F. P.

Alumina; Manufacture of — E. E. and P. C. Dutt, Jubbulpore, India. Eng. Pat. 120,838, 4.3.18. (Appl. 3767/18.)

A MIXTURE of an aluminous substance (e.g. bauxite or clay) with calcium chloride is heated to redness in the presence of arsenious oxide to produce calcium aluminate and arsenious chloride. Part of the calcium aluminate is dissolved in hydrochloric acid, and the remainder is added to the acid solution, whereby aluminium hydroxide and calcium chloride are produced; the arsenious chloride is treated with steam to regenerate arsenious oxide and hydrochloric acid.—W. E. F. P.

Sulphate of ammonia; Manufacture of [neutral] — S. E. Linder, Buckhurst Hill, Essex. Eng. Pat. 121,082, 3.6.18. (Appl. 9130/18.)

THE acidity of commercial ammonium sulphate is neutralised by agitating the dry or moist salt with the necessary quantity of ammonium carbonate in the form of powder or strong solution.—W. E. F. P.

Lead arsenate; Manufacture of — J. Lytle, jun., Formby, Lancs. Eng. Pat. 121,101, 19.8.18. (Appl. 13,436/18.)

LEAD arsenate is prepared by grinding lead carbonate (white lead) in a concentrated aqueous solution of arsenic acid.—W. E. F. P.

Gases; Method of and apparatus for conveying and absorbing — [Manufacture of sodium bicarbonate.] H. A. Frasch, New York. U.S. Pat. 1,282,799, 29.10.18. Appl., 1.3.17.

A CYLINDRICAL casing having inlets and outlets for gas and liquid is provided with a concentric rotary spiral-shaped drum (i.e., a sheet coiled in the form of a spiral) mounted on a horizontal shaft in the axis of the casing. The drum is partly immersed in the liquid in the casing, and the gas to be absorbed and conveyed is thereby confined in the upper portions of the convolutions of the drum. The drum is rotated in such a direction that the gas and liquid are conveyed towards the centre of the spiral and discharged. Several such machines are connected in series, so that the liquid and gas are conveyed through the series in opposite directions. The apparatus is particularly applicable for use in the manufacture of sodium bicarbonate by means of ammoniated salt brine and carbon dioxide.—W. F. F.

Phosphorus, phosphoric acid, etc.; Manufacture of — W. H. Waggaman, C. R. Wagner, and H. Bryan, Washington, D.C. U.S. Pat. 1,282,994, 29.10.18. Appl., 12.11.17. (Dedicated to the public.)

A MIXTURE of mineral phosphate, silica, and carbonaceous matter is fed down a shaft to a combustion zone heated to incandescence. The products of combustion pass around, but not in contact with the incoming material to preheat it. Phosphorus compounds are collected from the volatile products. —L. A. C.

Phosphoric acid; Process for the direct preparation of crystallised — [from fumes containing oxides of phosphorus]. J. N. Carothers and W. H. Ross, Washington, D.C. U.S. Pat. 1,283,398, 29.10.18. Appl., 18.2.18. (Dedicated to the public.)

FUMES of oxides of phosphorus evolved in smelting operations are collected by means of electric precipitation, using a connecting flue and precipitating system of such radiating surface that the fumes are precipitated above 100° C. The collected acid is allowed to cool below its melting point. (See also his J., 1917, 134.) —L. A. C.

Phosphorus fumes; Method for the recovery of — evolved in the volatilisation method of treating phosphate-rock. A. R. Merz, W. H. Ross, and J. N. Carothers, Washington, D.C. U.S. Pat. 1,284,200, 5.11.18. Appl., 25.7.16. (Dedicated to the public.)

PHOSPHORUS is recovered from the fumes evolved during the treatment of phosphate rock by the volatilisation method (this J., 1916, 1154; 1917, 134) by introducing into the fumes any substance which will react with the oxides of phosphorus, and collecting the compound formed on a filter. —L. A. C.

Salt-bearing ores; Apparatus for obtaining salts from — P. G. Darling, Wilmington, Del., Assignor to E. I. du Pont de Nemours and Co. U.S. Pat. 1,283,099, 29.10.18. Appl., 17.7.14.

AN elongated horizontal receptacle is fitted with mechanism for introducing and withdrawing solid or liquid, in any desired proportion, without the escape of vapour, and is provided with heating arrangements. The ore is fed into the apparatus at one end, and the solvent at the other end. As the extraction proceeds, the solid is carried continuously on an inclined conveyor, to the outlet, and thence to a draining receptacle or to a pressure filter heated by the waste heat from the extraction vessel. —S. S. A.

Potassium compounds in cement flue-dust; Method of increasing the solubility of — F. S. Moon, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,283,261, 29.10.18. Appl., 3.10.17.

CEMENT-KILN flue-dust is heated to near its sintering temperature by contact with gases substantially free from silicious ash, after which both the volatilised and the residual portions are leached to recover potassium compounds. —W. R. S.

Potassium salts; Process for recovery of pure — from kelp and like materials. S. R. Oppenheim, Keeler, Cal. U.S. Pat. 1,283,547, 5.11.18. Appl., 7.6.17.

A SOLUTION of crude potassium salts from kelp or similar materials is filtered through bone char in order to remove organic impurities.

Silicious minerals; Process of treating — for the production of chemical compounds. J. H. Stover, Trenton, N.J. U.S. Pat. 1,283,951, 5.11.18. Appl., 22.6.14.

SILICATE minerals are fused with an alkali base to form an insoluble compound silicate. Soluble products of the fusion are separated by leaching, the insoluble residue is decomposed with acid, soluble products are removed, and the residue digested with an alkali base. —L. A. C.

Ammonium perchlorate; Art of preparing — E. A. Le Sueur, Ottawa, Canada. U.S. Pat. 1,284,380, 12.11.18. Appl., 29.12.17.

AMMONIUM sulphate and sodium perchlorate are treated with water and heated to a temperature slightly above that at which substantial separation of hydrated sodium sulphate occurs, whereby a copious separation of ammonium perchlorate occurs. The liquor after filtering is diluted and chilled to obtain hydrated sodium sulphate. —J. H. P.

Electrolytic production of caustic alkali [and chlorine]; Process of and apparatus for — H. H. Dow, Assignor to The Dow Chemical Co., Midland, Mich. U.S. Pat. 1,284,618, 12.11.18. Appl., 12.8.15.

EACH electrolytic cell of a series is divided into anode and cathode compartments by a diaphragm of limited permeability to liquid. Each compartment of each cell is provided with an inlet and outlet, the outlet of each anode or cathode compartment being connected to the inlet of the succeeding anode or cathode compartment respectively. An alkali chloride solution is supplied to the first anode compartment, and the anode electrolyte in each cell is maintained at a higher level than the cathode electrolyte of that cell. Some electrolyte percolates through the diaphragms, and the excess passes successively from the anode compartments to the next in the series, then from the last anode compartment to the cathode compartment of that cell, and successively through the series of cathode compartments. Alkali hydroxide is withdrawn from the last cathode compartment, and the chlorine liberated in the process is collected. —B. N.

Liquefying air; Apparatus for — and separating it into its constituents. C. F. Crommett, Chelsea, Mass., Assignor to G. L. Cabot, Cambridge, Mass. U.S. Pat. 1,283,472, 5.11.18. Appl., 30.6.15.

THE apparatus comprises means for compressing, cooling, and drying air, and then separating it into three portions, the first of which is allowed to expand and used to liquefy the second portion, the third portion being utilised to evaporate the liquid produced from the second portion. Both a one-stage and a two-stage rectifier are fitted underneath with containers to receive liquid passing down from the rectifiers, and these containers communicate with an auxiliary container. All the containers are provided with liquefying chambers and liquid is delivered from each chamber attached to a rectifier to its respective rectifier. The gaseous mixture issuing from the one-stage rectifier is compressed and delivered to the liquefying chamber attached to the auxiliary container, liquid from this chamber passing to the two-stage rectifier. Nitrogen gas from the two-stage rectifier and oxygen gas, evaporated in the auxiliary container, pass to receptacles through conduits in which they respectively cool the gaseous mixture from the second compressor, and dry and cool a fresh supply of compressed air for use in the apparatus. —L. A. C.

Hydrating magnesian lime. U.S. Pat. 1,284,505. See IX.

VIII.—GLASS; CERAMICS.

PATENTS.

Glass manufacture. T. J. McCoy, Wichita Falls, Tex. U.S. Pat. 1,283,538, 5.11.8. Appl., 22.5.16.

The discharge chamber of a tank containing molten glass has a bottom wall inclined upwards, and adjacent side walls with ledges extending inwards. A cover-wall movable vertically is suspended freely between the ledges.—A. B. S.

Glass surfaces; Decorating — K. Wurga, Brooklyn, N.Y., Assignor to American Lithographic Co., New York. U.S. Pat. 1,283,606, 5.11.18. Appl., 16.8.16. Renewed 11.5.18.

The glass is decorated with mineral colours which are fusible at predetermined successive temperatures, the highest of which is below the fusion point of the glass. When several colours are superimposed, the most fusible is placed nearest to the glass. A combustible fixing agent which is insoluble in water, such as a mixture of spirits of turpentine 108 parts, fir balsam 50 parts, sugar of lead (lead acetate) 3 parts, and soft flux 1 part, may be mixed with the colour or applied to the glass. The colours are fixed by heating the articles to the required temperature.—A. B. S.

Glass drawing and blowing apparatus. W. E. Standley and T. B. Campbell, Pittsburgh, Pa., Assignors to Window Glass Rotary Pot Co. U.S. Pat. 1,285,450, 19.11.18. Appl., 20.8.15.

See Eng. Pat. 18,126 of 1915; this J., 1916, 1109.

IX.—BUILDING MATERIALS.

Cement; New researches on — K. Endell. Z. angew. Chem., 1918, 31, 233–234, 238–240.

A SURVEY of the literature on cement published during the last 10 years. The raw materials for Portland cement do not require special investigation beyond that necessary to secure the correct ratio of $\text{CaO} : \text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ in the finished product. Only glassy blast-furnace slags, which have been cooled rapidly and granulated, can be used for slag cement. If cooled slowly they fall to a useless crystalline powder. The constitution of Portland cement-clinker is not definitely established. Cobb (this J., 1910, 69, 250, 335, 399, 608, 799) has shown that calcium carbonate, silica, and alumina can react at $800^\circ\text{--}1200^\circ\text{C}$. without fusion, forming calcium silicates at temperatures much below the eutectic temperature. Sodium, magnesium, zinc, and barium silicates and aluminates may also be prepared in a similar manner. The incompletely burned and unsintered product in the manufacture of Portland cement, though largely soluble in $N/1$ hydrochloric acid, contains silicates and aluminates which are absorbed on heating to a higher temperature by the ternary or quaternary eutectic formed. Jesser and Dittler (Zement-Chemie, 1910, 71) observed first an absorption of heat (i.e. the fusion of a eutectic) when cement-mix was sintered at 1250°C .— 1380°C ., and the crystallisation of the chief constituent did not occur until the material had been heated to a higher temperature; this crystallisation was accompanied by evolution of heat. The triangular diagram summarising the researches at the Geophysical Institute, Washington (see this J., 1911, 543; 1915, 139), is reproduced, but it is suggested that, as equilibrium is seldom reached in burning cement-clinker, the phases indicated in the triangular diagram may not occur in commercial cement. The influence of iron oxide, magnesia,

alkalis, and sulphur trioxide on the position of the various areas in the diagram has not been investigated, though it is known that small percentages of ferrous oxide and manganous oxide prevent "dusting." Killig (Protokoll der Verh. des Vereins deutsch. Portlandzementfabrik., 1913) produced sufficiently large amounts of pure calcium aluminates to permit the examination of their mechanical properties. He confirmed the known high crushing strength of aluminous cement, but found that tricalcium aluminate expands after being mixed with water, and suggested that this substance does not occur in good Portland cement. The setting and hardening of cements have been studied microscopically by Ambrohn and others (this J., 1909, 366), Kaisermann (Diss., Jena, 1910), Blumenthal (this J., 1914, 964), and Scheidler (Diss., Jena, 1915). A 0.2% solution of alizarin orange or cryst. alizarin in dilute ammonia was used to identify lime, a similar solution of cyanin and chromotop 2R was used to identify alumina, acetic acid for combined silica, and neutral methylene blue for free silica. After the cement and water had been in contact for 2–3 hours, hexagonal plates of calcium aluminate were visible around the cement grains; these plates were free from silica. Fine needles of calcium silicate were also formed. After 3–4 days, large hexagonal crystals of calcium hydroxide appeared; in contact with the atmosphere these formed spherulites of calcium carbonate. Simultaneously, a gelatinous calcium silicate was formed. It was found that these substances are not simply the hydrated products of compounds present in the clinker, but are new compounds formed by the decomposition of the clinker by the water. The hardening of cement appears to be due to the formation and crystallisation of calcium aluminate and silicate and to a gelatinous calcium silicate which unites the crystals present. The increase in volume during hardening has been shown by Jesser (Protokoll der Verh. des Vereins deutsch. Portlandzementfabriken, Berlin, 1913) to be due to the tension of aqueous vapour in the atmosphere. In regard to the destruction of cement by water, etc., sulphates are harmful, but chlorides are negligible. The absorption of the SO_2 -radicle from sulphates causes large expansion of the cement and leads to its destruction. Synthetic calcium aluminium sulphate is decomposed by sodium chloride, magnesium chloride, and sea-water, and its formation in sea-water is therefore improbable. The expansion of cement in sulphate solutions increases with its content of alumina. Prolonged exposure to the air previous to immersion in the sulphate solution reduces the expansion, possibly on account of the decomposition of the calcium silicate and hydroxide by the carbon dioxide in the atmosphere. When cement is immersed in a magnesia solution, an equivalent amount of lime is replaced by magnesia.—A. B. S.

PATENTS.

Porous blocks; Apparatus for treating — F. S. Hoyt, Denver, Colo., Assignor to Fuller-Stow Co., San Francisco, Cal. U.S. Pat. 1,282,837, 29.10.18. Appl., 11.2.16.

An apparatus for treating porous blocks comprises an inclined retort and a tank for the impregnating material, both placed within a heating chamber, the tank being at a higher level. Means are provided for introducing hot air or gas into the retort containing the porous blocks and for exhausting it. The impregnating liquid passes from the tank through a pipe entering the lower end of the retort and terminating near the bottom, and means are provided for creating pressure within the retort in order to force back surplus impregnating material to the tank.—A. B. S.

Wood-preservation and process of making same. Wood-preservation treatment. J. A. de Cew, Montreal, Canada. U.S. Pats. (A) 1,283,104 and (B) 1,283,105, 29.10.18. Appl., 4.5 and 11.8.16.

(A) A wood preservative is made by dissolving a toxic oil, such as creosote oil, together with rosin in a soap solution and then diluting by forcing it under pressure into hot water. (B) Wood is heated to charring temperature in a solution of coal tar pitch, so that the contained water is expelled, and the outer portion of the wood is impregnated with the pitch, and the surface of the wood is then coated with a harder pitch at a higher temperature.

—A. B. S.

Wood; Process of treating — R. L. Gilliam, Assignor to The Gilliam Process Co., Columbus, Ohio. U.S. Pat. 1,283,495, 5.11.18. Appl., 26.8.14.

Wood, particularly that of the sweet gum tree, is subjected to the action of steam mixed with a solution of alkali, for the purpose of preventing it from warping or twisting.—A. B. S.

Fireproofing wood, textiles, etc. Bauholzkonservierung G.m.b.H., Berlin. Ger. Pat. 306,600, 15.1.14.

The wood or other material is impregnated with a solution of ammonium sulphate and magnesium sulphate to which have been added alkali salts, such as sodium or potassium sulphate, which will lower the melting point of the magnesium sulphate and, preferably, produce an eutectic mixture. When the proofed material is exposed to the action of fire, the magnesium sulphate on its surface fuses readily and protects the underlying material.—A. B. S.

Cement material and method of producing. A. S. Dwight and R. L. Lloyd, Assignors to Dwight and Lloyd Metallurgical Co., New York. U.S. Pat. 1,283,483, 5.11.18. Appl., 30.12.12.

CEMENT raw materials are mixed with finely-ground fuel and the mixture formed into a thin stratum, and sintered by igniting one face of the stratum and passing air through the material towards the other face. The layer of cement materials and fuel may be deposited on a layer of previously burned cement and covered by a thin layer of fuel alone.

—A. B. S.

Cement; Process for making waterproof — and product. H. M. Olson, Los Angeles, Cal. U.S. Pat. 1,283,546, 5.11.18. Appl., 19.1.17.

The cement whilst being ground is mixed with 1 part of an anhydrous oleaginous material free from driers and alkalis to 99 parts of the dry cement.—A. B. S.

Heat-insulating composition. F. A. Headson, Milwaukee, Wis. U.S. Pat. 1,283,754, 5.11.18. Appl., 22.1.17.

FINELY divided, calcined diatomaceous earth is mixed with finely divided asbestos, a binder, and water, moulded into the desired form, and hardened.—A. B. S.

Dolomitic or magnesian lime; Method of hydrating — C. and I. Warner, Wilmington, Del. U.S. Pat. 1,284,505, 12.11.14. Appl., 10.7.14.

SUFFICIENT water is added to the lime to hydrate the calcium oxide present, at atmospheric pressure; the magnesia is then hydrated in a closed vessel under a higher pressure by means of an additional amount of water.—A. B. S.

Artificial stone; Production of — A. Krieger, Ickern. Ger. Pat. 306,539, 25.9.17.

ARTIFICIAL stone with an unusually large proportion of sawdust, asbestos, etc., may be made with the aid of a binder composed of magnesium sulphate and quicklime or calcined dolomite or other oxides which form insoluble sulphates.—A. B. S.

Cement-making materials; Treatment of — H. Capenberg, Bochum. Ger. Pat. 308,884, 3.4.18.

ALUMINIUM chloride is mixed with the raw materials used for making cement. This reacts with the calcium carbonate, forming calcium chloride, aluminium hydroxide, and carbon dioxide. The aluminium hydroxide renders the mass more plastic and increases the strength of the bricks made from it, and the carbon dioxide retained in the mass increases its porosity and facilitates the burning of the cement.—A. B. S.

Cement flue-dust. U.S. Pat. 1,283,261. See VII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Cobalt silver ore; Smelting and refining of — S. B. Wright. Bull. 80, Canad. Min. Inst., Dec., 1918, 992—995.

At the Deloro Reduction Co.'s smelter, silver-cobalt ore is smelted in a blast-furnace (run with 6–8 oz. blast pressure on account of the large proportion of fines), the charge being calculated to furnish speiss and a neutral slag. The speiss contains Co 22–25, Ni 16–18, As 25, Fe 18, S 7, Cu 1%, and 1000–2000 oz. Ag per ton; it is first liquated to recover part of the silver, then ground, roasted, chloridised, washed with water, and treated with cyanide. The silver is precipitated from the solution with aluminium dust, the cyanide being almost quantitatively regenerated. The liquated and the precipitated metal are melted in an oil-fired furnace which is tilted backwards into blowing position; the metal after 3 hours' blowing is 992–995 fine, and is refined by another melting. The desilverised speiss is sulphatised and leached; the liquor is first freed from copper and iron, cobalt precipitated with hypochlorite solution, and nickel, after removal of the cobalt, with milk of lime. The hydroxides are filter-pressed, washed, and dried ready for sale, or mixed with charcoal and reduced; the crude metals are separated magnetically from excess of carbon, re-melted in electric furnaces, and granulated by pouring into water. The dust and fume from the various furnaces, collected in a bag-house, are heated in a coke-fired reverberatory, and the pure arsenic trioxide condensed in chambers. The clinker from this operation goes back to the blast furnace for the recovery of silver.—W. R. S.

PATENTS.

Furnaces; Electric muffle — [for heat treatment of steel]. W. F. Jones, Birmingham. Eng. Pat. 120,944, 25.10.17. (Appl. 15,505/17.)

A VACUUM is established in the chamber of an electric resistance muffle furnace, containing resistance heating elements and the steel tubes and bars to be treated. The chamber is provided with a vacuum "lock" or "locks" and suitable gear, so that the tubes or bars may be introduced into and withdrawn from the muffle without destroying the vacuum or appreciably lowering the temperature. Cradles containing the articles to be treated are

mounted on "run-ways," and moved in the furnace and locks by means of endless ropes or chains. The vacuum in the lock may be destroyed by a jet of steam or water, so that the cover or door may be opened and the contents quickly ejected to a "quenching" tank. Any air remaining in the furnace, after evacuation by an air pump, is circulated by a fan through a small auxiliary furnace containing metal turnings for absorption of oxygen.—B. N.

Steel; Manufacture of — H. C. Dickson, Halesowen, and J. B. Micklin, Smethwick. Eng. Pat. 121,311, 10.11.17. (Appl. 16,512/17.)

A STEEL of medium tensile strength, and with high resistance to fatigue and shock, contains 0.1 to 0.3% C, 0.08 to 0.25% Si, 0.4 to 1% Mn, 0.05 to 0.2% V, 0.05 to 0.25% Cr, with sulphur and phosphorus as low as possible. The best combined results for machining, tenacity, and toughness are obtained by rolling the metal hot to nearly the required size, and reducing further by cold drawing or cold rolling, without annealing. If required in the form of sheets or slabs, the hot-rolled metal may be improved by a normalising process.—C. A. K.

Steel; Manufacture of — direct from iron ores. L. T. Grouselle, Grenoble, France. U.S. Pat. 1,284,094, 5.11.18. Appl., 4.8.17.

AN ore-reducing chamber, into which reducing gases can be admitted, extends downwards into a melting chamber which is independently heated. The flue conveying the waste gases is separately connected with the reducing and melting chambers.—C. A. K.

Ferrosilicon; Process of making — G. C. Furness, New York, Assignor to Electro Metallurgical Co., Niagara Falls, N.Y. U.S. Pat. 1,284,645, 12.11.18. Appl., 26.3.18.

A CHARGE comprising silica, a reducing agent containing a high percentage of fixed carbon, a source of iron, and bituminous coal, the bituminous coal being more coarsely graded than the rest of the carbonaceous reducing agent, is smelted in an electric resistance furnace between deeply embedded electrodes.—J. F. B.

Lead; Extraction of — E. S. Berglund, Trollhättan, Sweden. Eng. Pat. 114,303, 19.2.18. (Appl. 2936/18.) Int. Conv., 10.3.17.

THE charge is introduced continuously into a hermetically closed electric furnace from which the molten lead is removed through a siphon tap while the non-condensable gases escape through a water-seal from a condenser connected to the furnace.—W. R. S.

Roasting furnace; Mechanical — G. Gröndal, Djursholm, Sweden. Eng. Pat. 115,639, 7.5.18. (Appl. 7650/18.) Int. Conv., 24.3.17.

FOR the roasting of materials which require a relatively high temperature, the hearth of a furnace is heated from the under side by flues conveying the products of combustion from a fire-grate. The material fed on to the hearth is moved forward towards the hotter end by a movable arch provided with rabblies. The arch as a whole is capable of being moved forward a certain distance, then raised, and brought back to its original position, the rabblies being out of contact with the material on the hearth during the return movement.—C. A. K.

Metallurgical furnace. J. Kralund, Brooklyn, N.Y., Assignor to Doehler Die Casting Co. U.S. Pat. 1,284,711, 12.11.18. Appl., 10.9.15.

A CRUCIBLE furnace is fitted with a rotary supporting block, near the outer edge of which a number of crucibles are placed. When the desired temperature is attained, crucibles may be successively drawn from, or inserted into, the furnace, through an opening in the side wall.—C. A. K.

[Metallurgical] furnaces; Lining for — W. C. Ely, Terre Haute, Ind. U.S. Pat. 1,284,880, 12.11.18. Appl., 5.2.16.

THE walls of a furnace are built of hollow blocks of refractory material, forming a cellular structure open to the atmosphere. An inner lining of metal is provided which melts on heating the furnace, and causes molten slag to enter the cells. The slag is chilled by the cooling action of the outside air and forms a solid refractory lining.—C. A. K.

Metallic surfaces; Preserving — N. C. F. Jensen, Southall, Middlesex. Eng. Pat. 121,150, 6.11.17. (Appl. 16,197/17.)

THE articles are coated with oil (e.g. a mixture of whale oil and mineral oil), then heated to a temperature high enough to gasify the volatile constituents in an oven which permits the escape of the lighter gases. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 2022 of 1873, 4486 of 1874, 9570 and 9848 of 1888; 1146 of 1896, 3682 of 1904, and 3945 of 1915; this J., 1889, 715, 712; 1904, 556; 1916, 54.)—W. R. S.

Orès [galena and blende]; Concentration of — by flotation. E. Edser, S. Tucker, and Minerals Separation, Ltd., London. Eng. Pat. 121,303, 13.9.17. (Appl. 13,131/17.)

THE freshly-ground ore is agitated, with or without aeration, with water containing small proportions of sodium silicate and of a soluble soap, to produce a froth carrying the galena. After separation of the froth, the liquor is diluted with water and again agitated for the flotation of the zinc blende.—W. R. S.

Metal spraying apparatus. T. S. Worthington, Montreal, Canada. Eng. Pat. 121,344, 12.12.17. (Appl. 18,437/17.)

THE apparatus consists of a cylindrical metal container, with a conical bottom, and open at the upper end, fitted concentrically in a similarly shaped closed container, so that an annular space is formed between the two vessels. An outlet from the apex of the conical section of the outer vessel is connected with the air branch of a blowpipe burner, the fuel gas being admitted through a second branch. The air supply to the burner is obtained by maintaining a positive pressure of air in the metal container, the air passing evenly down the annular space and through the connecting pipe to the burner. Powdered metal, contained in the inner vessel, is allowed to fall through an opening regulated by a spindle valve, into the air current as it leaves the outer container, and the metal dust passing through the flame is blown on to the article to be coated, in a molten or plastic condition.—C. A. K.

Zinc retort furnace. A. Jones, Langeloth, Pa., Assignor to Metallurgical Co. of America, New York. U.S. Pat. 1,282,347, 29.10.18. Appl., 4.1.16.

A RETORT furnace contains a number of pillars spaced apart incorporated in its wall, each pillar being built up of blocks extending outwards beyond the face of the wall. Each pillar block has a vertical passage through the portion extending beyond the face of the wall, and a port leading from the passage and communicating with the retort chamber; the vertical passages in the pillar blocks are in alignment. Shelves for supporting the retorts at one end are provided between the blocks of each pillar.—W. R. S.

Zinc; Electrolytic production of — G. H. Cleverger, Palo Alto, Cal. Assignor to H. W. Gepp, Melbourne, Australia. U.S. Pat. 1,283,077, 29.10.18. Appl., 7.5.17.

COBALT is removed from zinc sulphate electrolytes containing manganese by neutralising the liquid, and then precipitating the cobalt by means of an oxidising agent.—B. N.

[Electrolytic] zinc cell. J. L. Malm, Denver, Colo. U.S. Pat. 1,284,493, 12.11.18. Appl., 29.7.14.

TWO or more rows of cell chambers are arranged in a casing, with a trough between the rows. The trough is provided with a partition, and with ports for supplying separate portions of untreated material to the several cell chambers. The cover of the trough is spaced from the top of the partition, and means are provided for leading off gas from the top of the trough. A port in the casing leads from a point above the bath to a point below the surface. Anode supports, carrying the anodes, are arranged upon the bottom of the cells, with suitable connections from the anode to the outside of the cell, and a second electrical connection leads to a point in the port below the surface of the bath.—B. N.

Hot-work article [alloy]. J. W. Taylor, New Waterford, Ohio. U.S. Pat. 1,282,981, 29.10.18. Appl., 9.3.17.

A STEEL alloy for hot-work articles, e.g., forging dies, contains 1.5 to 3.0% C and from 3.0 to 7.0% Cr.—C. A. K.

Detinning process; Chlorine — W. Zacharias, Pittsburgh, Pa. U.S. Pat. 1,283,016, 29.10.18. Appl., 24.6.15.

IN a process of detinning by chlorination, the reaction temperature is modified by introducing a finely divided metal, e.g., tin, into the reaction chamber.—W. R. S.

Alloy; Precious-metal — W. E. Mowrey, St. Paul, Minn. U.S. Pat. 1,283,264, 29.10.18. Appl., 15.4.16.

AN alloy for dental, jewellery, and electrical purposes contains Pd 15, Ag 35, and Au 50%.—W. R. S.

Cyanide solutions; Continuous method of treating — Method of treating metal-bearing solutions. Organised apparatus for treating cyanide slimes. (A) and (B) L. C. Trent, (C) L. C. Trent and S. W. Mudd, Los Angeles, Cal. U.S. Pats. (A) 1,283,363, (B) 1,283,364, and (C) 1,283,365, 29.10.18. Appl., 24.8.14.

(A) THE ore pulp is agitated with the solvent by withdrawing material from the top and returning it to the bottom of the containing vessel. The mix-

ture is drawn off to another vessel wherein it is subjected at its lower part to a gentle agitation to form zones of separation. The clear liquid containing values is withdrawn at the top for further treatment, and fresh solvent or solvent containing less dissolved material is supplied to the thickened material at the bottom. The solid residue is withdrawn and treated again in a similar manner. (B) In the process described in (A) the material under treatment is circulated by withdrawing it from the lower thickened zone and returning it to the same zone. Fresh solvent is also forced into it at this point to effect a further solution of the values and to displace the saturated solution at the top of the vessel. (C) The ore pulp is treated as above in four vessels successively, the saturated solvent being withdrawn at the top of each vessel by introducing fresh or more dilute solvent at the bottom into the solid material. The solid material is withdrawn by a pump and transferred to the next vessel, and at the same time is mixed with fresh solvent.—W. F. F.

Lead alloys and alloys containing lead, tin, copper, or antimony; Refining — F. A. Stief, East St. Louis, Ill. U.S. Pat. 1,283,427, 29.10.18. Appl., 6.5.15.

ALLOYS of lead, tin, copper, and antimony, containing arsenic, are treated continuously in a thin layer at a red heat with iron and carbon, the resulting speiss being separated from the cooled mixture in a settling-chamber by skimming.—W. R. S.

Smelting ore; Process of — J. H. Gray, New York. U.S. Pat. 1,283,500, 5.11.18. Appl., 20.7.17.

A BLAST of pure oxygen is introduced into a charge of ore and carbon so that the combustion of the carbon is effected in a comparatively small space (as distinguished from the high shaft of the ordinary blast furnace). The complete reduction of the ore is accomplished in the same space, and the charge of ore above is only such as to keep the localised reaction space filled.—C. A. K.

Ores; Process of roasting — W. A. Isgham, Los Angeles, Cal. U.S. Pat. 1,283,782, 5.11.18. Appl., 21.2.18.

ORES containing antimony sulphide are ground, and a thin layer is heated in a closed roasting chamber to a temperature sufficient to volatilise antimony sulphide, the vapours being withdrawn, and oxidised to form antimony oxide.—C. A. K.

Electroplating; Method of — W. Thum, Hammond, and J. J. Mulligan, East Chicago, Ind., Assignors to United States Metals Refining Co., New York. U.S. Pat. 1,283,973, 5.11.18. Appl., 31.7.18.

IRON, steel, and kindred base metals, are electroplated directly, by covering the surface to be plated with a protective film of gelatin, and subjecting the article to a current of abnormally high current density for a short interval, and then to a normal current density until the desired thickness of deposit has been obtained.—B. N.

Antimony smelting; Starring mixture for — C. Y. Wang, Hankow, China. U.S. Pat. 1,284,164, 5.11.18. Appl., 14.9.17.

THE mixture is composed of potassium carbonate and iron sulphide resulting from the precipitation process of antimony smelting.—W. R. S.

Metals from ores; Process for recovering — C. L. Larson, Kellogg, Idaho, Assignor to Bunker Hill and Sullivan Mining and Concentration Co., San Francisco, Cal. U.S. Pat. 1,284,910, 12.11.18. Appl., 30.4.17.

ORES containing lead sulphide and other metals (e.g., copper, silver, gold) are treated so as to convert the metal values into a form soluble in brine. The contained metals, other than lead, are precipitated from the brine solution, and the lead is recovered by electrolysis. Any sulphates which may have accumulated are eliminated from the barren brine liquor, which can then be used for leaching a fresh portion of the treated ore.—C. A. K.

Iron and steel; Process of making — in electric furnaces. B. Humbert, Welland, Ont., Canada. Eng. Pat. 121,674, 20.2.18. (Appl. 3420/18.)

SEE U.S. Pat. 1,252,443 of 1918; this J., 1918, 155 A.

Ferrosilicon; Producing — in blast-furnaces. J. E. Johnson, jun. Reissue 14,547, 12.11.18, of U.S. Pat. 1,231,260, 26.6.17. Appl., 8.10.18.

SEE this J., 1917, 928.

Washing gold, etc. Eng. Pat. 121,512. See I.

Reducing oxides. U.S. Pat. 1,283,286. See XI.

Fertiliser. U.S. Pat. 1,283,677. See XVI.

Testing hardness. U.S. Pat. 1,283,362. See XXIII.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Furnaces; Electric — E. Grammont, Lyons, France. Eng. Pat. 120,786, 28.11.17. (Appl. 17,612/17.)

THE hearth of the furnace, acting as the lower electrode, is formed of a metal plate, e.g., copper, an intermediate layer of conducting agglomerate (e.g., carbon and pitch or tar), and an upper layer of insulating refractory material in which wells are provided at intervals. The material to be treated is partly contained in the wells, so as to produce convection currents in the molten material.—B. N.

Furnaces; Electric — T. H. Watson and Co. (of Sheffield), Ltd., H. A. Greaves, and H. Etchells, Sheffield. Eng. Pat. 121,563, 18.4.18. (Appl. 6563/18.) Addition to Eng. Pat. 106,626, 1.3.16 (this J., 1917, 891).

A METHOD of distributing three-phase currents so that the supply phases tend to have balanced loads, consists in the arrangement of three transformer secondary windings grouped in "delta," the terminal junctions being connected respectively to two upper electrodes, or groups of electrodes, and to a third electrode in the conducting hearth. The three transformer primary windings are grouped in "star," the ratio of transformation between the various transformer windings being arranged so that the three primary phases of supply are equally loaded for power and power factor, for any predetermined value of hearth resistance up to the resistance of one of the arcs, when the secondary system comprised by the furnace is symmetrically loaded, i.e., when the two upper electrodes are each conveying equal power.—B. N.

Furnace; Laboratory [electric] — Process of [electrically] reducing metallic [tungsten] oxides. C. A. Pfanstiehl, Highland Park, Ill., Assignor to Pfanstiehl Co., Inc., North Chicago, Ill. U.S. Pats. (A) 1,283,285 and (B) 1,283,286, 29.10.18. Appl., 17.7. and 16.11.16.

(A) THE furnace comprises a substantially horizontal base having a groove in its upper surface, and a hollow cover which fits within the groove. The groove contains a sealing liquid, and the cover is provided with a water jacket having flexible inlet and outlet pipes, so that it may be raised or lowered without interrupting the flow of water. An observation window is clamped against the body of the furnace, a duct containing sealing liquid preventing gas from passing between the body of the furnace and the window. Electrical conductors and a rotary shaft extend through the base, and inlet and exhaust pipes conduct gases to and from the body of the furnace chamber. The joints of the device, except those which are soldered, are surrounded by a sealing liquid, so that the furnace may be allowed to stand for long periods without danger of escape of enclosed gas or entrance of the outside atmosphere. (B) Finely powdered tungsten trioxide is reduced by passing a blast of highly heated hydrogen over its surface, whilst heating the oxide just sufficiently to overcome radiation, and to vaporise the moisture formed in the action.—B. N.

Electrode [; Silicon-iron —]. W. K. Page, Assignor to Chile Exploration Co., New York. U.S. Pat. 1,283,280, 29.10.18. Appl., 28.1.18.

MOLTEN silicon-iron is cooled to approximately the lowest temperature at which it will be sufficiently fluid to cast, and is then poured into a metal mould heated to about 300° C. Copper lugs are embedded in the electrode during the casting operation, the cast electrode being removed from the mould before it falls materially below a cherry-red heat, and embedded in kieselguhr to effect tempering. The slow cooling produces a fine, dense, resistant structure, extending for a considerable distance from the surface.—B. N.

Electric batteries; Wood separators for secondary — The Chloride Electrical Storage Co., Ltd., and B. Hcap, Manchester. Eng. Pat. 121,188, 6.12.17. (Appl. 18,102/17.)

THE separators are made from wood which does not swell or expand unduly when immersed in an alkali solution. They are first cut to the desired shape and thickness, treated with a weak alkali solution, washed, and then dried rapidly in a heated vacuum oven.—B. N.

Storage batteries; Negative plate for — Process of making storage-battery electrodes and filling mass therefor. W. Morrison, Chicago, Ill. U.S. Pats. (A) 1,284,425 and (B) 1,284,426, 12.11.18. Appl., 19 and 23.2.18.

(A) NEGATIVE storage-battery plates are made by sand-blasting the grids, filling them with lead oxide, and electrolytically reducing the oxide to spongy lead in magnesium sulphate solution, whereby the reduced lead is maintained in intimate contact with the roughened grid. (B) The "filling mass" is saturated with water, and the plate "formed" in a sulphuric acid electrolyte.—B. N.

Electrical treatment of gases. Eng. Pats. 107,389 and 119,236-8. See I.

Separation of suspended particles. Eng. Pat. 120,994. See I.

Concentrating nitric acid. U.S. Pat. 1,283,598. See VII.

Sulphuric acid. U.S. Pats. 1,284,166, 1,284,167, 1,284,175, and 1,284,176. See VII.

Electrolytic process. U.S. Pat. 1,284,618. See VII.

Electric furnace. Eng. Pat. 120,944. See X.

[*Electrolytic*] *zinc cell.* U.S. Pat. 1,284,403. See X.

XII.—FATS; OILS; WAXES.

Fats; Oxydase reaction of — as a means of detecting rancidity. J. Prescher. Z. Unters. Nahr. Genussm., 1918, 36, 162–166.

INVESTIGATION of the reaction described previously by Vintilescu and Popescu (this J., 1915, 1214), which depends on the blue coloration obtained when a rancid fat is shaken with blood solution and gualiacum tincture, showed that it is reliable for the detection of rancidity in butter and tallow. Fresh fats do not give the reaction and free fatty acids do not interfere with the coloration yielded by rancid fats.—W. P. S.

Fats and waxes; Vegetable and animal —. II. A. B. Weinhausen. Z. physiol. Chem., 1918, 103, 84–86.

A SOLID fat containing no glycerides can be extracted from rice bran. Ether also extracts an oil containing 1.7% of glycerol. (See further J. Chem. Soc., Feb., 1919.)—H. W. B.

Soya beans. Fellers. See XVI.

PATENTS.

Oils or liquids; Apparatus for expressing — from seeds, nuts, and other oil or liquid containing materials and substances and for compressing the residuum into solid form. A. W. Sizer, Kingston-upon-Hull. Eng. Pat. 120,147, 19.9.17. (Appl. 13,453/17.)

IN apparatus of the worm-screw compression type (see Eng. Pat. 29,331 of 1912; this J., 1914, 428), a tube is mounted within the cylindrical casing in which the worm rotates, so that it encloses part of the worm, and rotates round it. The walls of the tube contain a number of tapered longitudinal passages, whilst at the end of the tube is a hollow plate or cap provided with outlets formed by an arrangement of tubes through which the expressed oil can escape into a receiving tank. Means may also be provided for assisting the expression of the oil by the creation of a vacuum, whilst a knife or knives may be mounted on the shaft of the compressing worm for cutting the expressed material extruded from the press into pieces of suitable length.—C. A. M.

Oil cake and like hydraulic presses. B. C. Barton, North Ferriby, Yorks. Eng. Pat. 120,990, 5.12.17. (Appl. 17,996/17.)

THE press-plates have the form of an inverted rectangular box without ends. The top of the box is provided with a number of transverse ribs upon which rests a perforated metal plate, which is secured to some of the ribs, and is of the same length but slightly wider than the length of the ribs so that it will fit into the box immediately

above. Each box is provided with bolts which pass through holes in directly opposite positions in the side walls and through spaces between the transverse ribs immediately beneath the perforated plate on the top of the box next below; the lower box is thus supported by its perforated plate on the bolts in the box above. Each box can rise in telescopic fashion into that above it. The bottom box of the series has an enlarged bottom with edges turned up to form a channel for receiving the expressed oil, whilst the top box, which has a closed top, is provided with flanges by means of which it can be bolted to the underside of the press-head. The charge of seed, etc., to be pressed may be placed in removable perforated metal trays which are left in the press during the expression.

—O. A. M.

Clarifying oil; Process for —. A. G. Munro, San Antonio, Tex., Assignor to Refiners Engineering and Supply Co. U.S. Pat. 1,284,750, 12.11.18. Appl., 7.4.17.

OIL is clarified and separated from fullers' earth by filtering the sludge in a filter-press provided with means for successively forcing air, water, and steam therethrough.—A. de W.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS

PATENTS.

Japan; Manufacture and application of —. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 121,533, 7.1.18. (Appl. 988/18.)

A JAPAN, of a consistency suitable for application without the use of an inflammable solvent, is obtained by heating together japan, water, and a suitable alkali, e.g., ammonia or sodium or potassium hydroxide, in an enclosed space until an emulsion is formed. The constituents of a japan which would prove incompatible when dissolved together in the usual inflammable solvents may be separately emulsified and the emulsions then mixed. A coating of japan may be applied to an electrically-conductive object by immersing the same in the japan emulsion, electrolysis by employing the object as anode, and finally baking the coating obtained. An object may alternatively be coated by heating materially above 100° C., e.g., to 250° C., plunging into the cold emulsion, withdrawing it and finally baking. (See also U.S. Pat. 1,266,335 of 1918; this J., 1918, 476 A.)—A. de W.

Oils; Process and apparatus for the oxygenation and polymerisation of —. J. K. Blogg, Surrey Hills, Victoria. U.S. Pat. 1,284,572, 12.11.18. Appl., 19.12.17.

OIL, e.g., linseed oil, is simultaneously polymerised and oxidised for printing-ink varnish by heating it in a closed retort over an open fire, a current of air being drawn through the body of oil by exhausting the air in the retort above the surface of the oil by means of a water-jet ejector. Air is supplied to the oil by means of a valved supply pipe open to the air at its upper end and extending to the bottom of the retort. A condenser is interposed between the ejector and the retort. The degree of exhaustion above the liquid level is increased when the flash-point of the oil is reached by closing the valve of the supply pipe, thus discontinuing the supply of air.—A. de W.

Drying pigments. Eng. Pat. 121,372. See I

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Influence of certain chemicals on the inner qualities of — O. de Vries, H. J. Hellendoorn, N. L. Swart, J. C. Hartjens, and A. J. Uité. Comm. Centr. Rubber Stat., Buitenzorg, Java, 1918, 2, No. 6, 1–38.

THE addition of sodium sulphite or bisulphite to latex causes a slight improvement in the properties of the rubber; a small increase is observed in the tensile strength, viscosity index, and rate of vulcanisation and a small decrease in the "slope." The effect is more marked in smoked sheet than in pale crepe. With sodium thiosulphate the result is a very small decrease in the viscosity and the rate of vulcanisation, the alteration in tensile strength and slope being negligible. Sodium carbonate in the customary proportions as an anti-coagulant has very little influence on the quality of the rubber. Formalin has an effect just contrary to that of the sodium sulphites; with formalin the direct influence of the substance as well as its effect in preventing putrefactive change act in the same direction, whereas with the sulphites the result of the antiseptic effect is opposed to the changes actually observed and tends to reduce these in extent. Sodium acetate causes an increase in the viscosity and in the rate of vulcanisation, whilst sulphurous acid, when used as a coagulant, effects a small increase in the tensile strength and viscosity and a marked decrease in the slope. The effect observed in the use of the sodium sulphites is probably to be attributed to the combined action of the sodium acetate and sulphurous acid produced by the interaction of the sulphite with the acetic acid used for coagulation.—D. F. T.

Rubber; Regeneration of vulcanised —: estimation of metastable rubber. A. Dubosc. Caoutchouc et Gutta Percha, 1918, 13, 9646.

ACCORDING to HARRIS (this J., 1916, 747) vulcanised rubber contains a mixture of "polyprene sulphide" which yields a hydrochloride insoluble in chloroform, with "stable" rubber which under the influence of the sulphur has undergone molecular change so that its hydrochloride is insoluble in chloroform, and unaltered "metastable" rubber the hydrochloride of which is soluble in chloroform. The value of rubber scrap or reclaim should be dependent on its content of "metastable" rubber. A method is described for the prolonged treatment of finely divided vulcanised rubber with dry hydrogen chloride in a cooled vessel; by extracting the product with chloroform the hydrochloride of the "metastable" rubber can be removed and its amount determined.—D. F. T.

Rubber; Ageing of vulcanised — O. de Vries. Indiarubber J., 1919, 57, 77–81.

As the result of further experiments on the ageing of a mixing of rubber (92.5%) and sulphur (7.5%) vulcanised for various periods at 143° C. (compare this J., 1917, 296) it is shown that the product obtained by vulcanising for 70 mins., if subsequently heated at 72° C. for 24 hours, gives a similar stress-strain curve to the product obtained with a vulcanisation period of 90 mins. without any subsequent "ageing." Heating at 72° C. for 24 hours produces no appreciable change in the degree of vulcanisation, but its effect on the mechanical properties as represented by the stress-strain curve is evidently equivalent to an extension of the period of vulcanisation by 20 mins., or, in other words, the effect of the accelerated ageing in the above experiment renders it possible with one mixing to obtain vulcanised products of quite different vulcanisation coefficients but exhibiting coincident

stress-strain curves. Although the curves follow the same course, however, that for the "aged" sample is less prolonged because the increase in tensile strength observed on ageing for one day is less than that produced by the extended vulcanisation. With continued ageing at 65°–72° C. the rate of alteration in the position of the stress-strain curve steadily decreases, but no steady condition is attained, the samples finally becoming brittle like over-vulcanised rubber. It is noteworthy, however, that whereas for the first day the effect of ageing is greater the lower the vulcanisation coefficient, the alteration on the subsequent days (as recorded by the elongation at a certain load) is the same for rubbers with vulcanisation coefficients between 2 and 4. It is suggested that it will be necessary to examine ageing phenomena not only with one mixing, but with mixings containing varying amounts of sulphur and also containing the commoner compounding ingredients. In examining vulcanised rubbers prepared by different methods and of uncertain history, it will be advisable to record not only the vulcanisation coefficient but also the stress-strain curve and possibly other characteristics. In an investigation as to whether the method of testing rubber 24 hours after vulcanisation gives as trustworthy comparative results as testing after 3 or 4 days, it was found that the difference of 5–10% observed in the elongation at 1.3 kilos. load under the two methods corresponds only with a difference of 2–3 mins. in the period of vulcanisation; the conditions of the test, as generally performed, are such that a small shifting of the curve causes no appreciable difference in the tensile strength and the rest period of 24 hours after vulcanisation is quite sufficient for trustworthy results to be obtained; indeed the variation observed between different samples of the same rubber was actually slightly less after 24 hours than after 72 hours.—D. F. T.

XV.—LEATHER; BONE; HORN; GLUE.

Tanning materials; Comparative analysis of — R. W. Griffith. J. Amer. Leather Chem. Assoc., 1918, 13, 382–388.

A COMMITTEE of sixteen chemists has studied the analysis of four materials, i.e., solid chestnut and quebracho extracts, ground divi-divi, and ground mangrove bark, by the hide-powder method. The results show that storing of hide powder for a year does not affect its quality, and that variations in the acidity of chrome alum used for chroming the hide powder have no effect on the results of analyses. It is recommended that the temperature of chroming and detanning be kept within defined limits. The analyses of chestnut extract gave the best concordance, the difference between the maximum and minimum being 2.64% of tannin. In the case of the solid extracts, the greatest differences in the tannin values are attributable to the variation in the amounts of insoluble matter found. In the case of divi-divi, which is not easily sampled, the difference was 12.28% of tannin. The non-tannins show a variation equally great.—F. C. T.

Chrome [tanning] liquors; Investigation of — J. R. Blockey. J. Soc. Leather Trades' Chem., 1918, 2, 205–212.

MEASUREMENTS of hydron concentrations by means of the hydrogen electrode show that the acidity of green chrome solutions is roughly ten times that of violet solutions of equal strength, the cause being the greater hydrolysis in the green solutions. This explains the greater swelling action on hide of the

green solutions. The difference in colour probably depends on the degree of ionisation. Undissociated molecules are violet, whilst chromium ions are green. The colour differences may also be explained by Werner's theory of the constitution of the hydrates of chromic chloride. As violet and green solutions are diluted, the differences become less marked. A violet solution when made basic by gradual addition of sodium carbonate or hydroxide gives a permanent precipitate much sooner than a green solution. The hydrogen electrode may under certain conditions be used for determining the basicity (i.e., ratio of Cr to SO_4) of chrome liquors. If liquors are made up in the same way and are of fairly constant strength, they show a definite hydron concentration corresponding to the basicity. A graph should be constructed from observations on liquors of known basicities.—F. C. T.

Chrome [tanning] liquors; Analysis of one-bath — C. Smith and F. Enna. J. Soc. Leather Trades' Chem., 1918, 2, 213–214.

THE oxidation of chromium salts to chromate in liquors containing organic matter is not always easy; on acidification prior to determination of the chromate the organic matter sometimes causes reduction back to chromic salt. The authors describe a rapid method free from this difficulty. Chromic hydroxide is precipitated from the liquor, washed, and oxidised after dissolving in hydrochloric acid. The Procter-McCandlish titration for SO_4 (this J., 1907, 458) is modified to permit of rapid execution. 5–10 c.c. of a liquor containing less than 0.8 gm. of chromium per litre is diluted with 100 c.c. of boiling water, and immediately titrated with N/10 sodium hydroxide solution, using 4–6 drops of 1% phenolphthalein solution as indicator. The containing beaker should be placed on a white tile, and the end-point, i.e., the appearance of a grey-violet colour, is quite sharp. The method gives consistent and accurate results.—F. C. T.

Chrome [tanning] liquors; Analysis of single-bath — A. Harvey. J. Soc. Leather Trades' Chem., 1918, 2, 215.

A LIQUOR containing ammonium compounds gives false results for SO_4 when titrated boiling with N/2 sodium hydroxide solution according to the Procter-McCandlish method (this J., 1907, 458). The ammonia must first be removed by distillation with alkali, and the equivalent amount of alkali deducted from that used in titration before calculating the SO_4 content.—F. C. T.

Chrome [tanning] liquors; Statement of basicity of — H. R. Procter. J. Soc. Leather Trades' Chem., 1918, 2, 259.

BASICITY is usually expressed in Europe as parts of SO_4 combined with 52 of Cr, and in America as the fraction $\text{Cr}_2\text{O}_3/\text{SO}_4$. A better and more general method, applicable for instance to aluminium compounds, is to express basicity as the proportion of basic to acid valencies, the normal salt being unity. For instance, the basicity of $\text{Cr}_2(\text{SO}_4)_3$ would be 6:6 or 1; that of $\text{Cr}(\text{OH})\text{Cl}_2$ would be 3:2 or 1.5; that of bisulphates, bisulphites, and bichromates would be 0.5; that of normal sulphates, etc., unity.—F. C. T.

[Tannery] lime liquors; Sodium sulphide in — H. Hayes. J. Soc. Leather Trades' Chem., 1918, 2, 258.

IN the determination of sodium sulphide in lime liquors by N/10 ammoniacal zinc sulphate, direct titration is not satisfactory. It is better to add an excess of sulphate solution to a comparatively

large volume of lime liquor, then render faintly acid with acetic acid, shake and filter, and finally estimate the zinc not precipitated. This can be done by titration with potassium ferrocyanide using uranium acetate as external indicator.

—F. C. T.

Leather chemistry; Recent developments in — H. R. Procter. J. Roy. Soc. Arts., 1918, 66, 747–753 and 776–781.

Two lectures in which the advances in leather chemistry during the last ten or twenty years are discussed.—F. C. T.

PATENTS.

Tanning; Process of — and manufacture of tanning liquors. C. Blanc, Paris. Eng. Pat. 120,049, 17.10.18. (Appl. 16,908/18.) Int. Conv., 27.9.17.

CHROME tanning liquors are prepared by the reduction, in an acid medium, of chromic acid by cellulose or lignocellulose materials in a finely divided state, e.g. sawdust, cotton and paper waste, spent tan, etc., which may or may not have been previously treated with hydrolysing acids. The reduction takes place fairly rapidly in concentrated solutions provided the temperature is maintained for an hour or two at 100° C., or higher if a more basic liquor is desired. The reduced liquors are filtered through sawdust to remove fine oxycellulose powder and are employed in tanning.—D. W.

Tanning; Method of — R. B. Cock, Gomshall, Surrey, and W. W. Williams, Rhyddlan, Flint. Eng. Pat. 121,325, 9.12.17. (Appl. 18,183/17.)

FOR the production of sole leather or dressing leather delimed hides are tanned in pits or drums with a tanning extract containing equal parts of myrobalans, gambier, quebracho, and mimosa. The strength is gradually increased from 30° to 60° Barkometer and a mixture of sodium thiosulphate, aluminium sulphate, vaseline, glycerin or lanoline, and turpentine is added to the tanning liquors. The tannage is completed by treating the hides for 4 hours in each of three rocker pits containing liquors of 90°, 100°, and 120° Barkometer at 110° F. (43° C.). The goods are finished in the ordinary way.—D. W.

XVI.—SOILS; FERTILISERS.

Soil aldehydes. A new class of soil constituents unfavourable to crops, their occurrence, properties, and elimination in practical agriculture. J. J. Skinner. J. Franklin Inst., 1918, 186, 165–186, 289–316, 449–480, 547–584, 723–741.

THE author has examined seventy-four soils of which fourteen were garden soils and sixty field soils; of these latter thirty were classed as productive and thirty as unproductive, being collected in pairs from the same soil type and the same field or locality. Of the fourteen garden soils, five contained aldehydes, and of the sixty field soils aldehydes were present in twelve, these being divided amongst the productive and unproductive soils in the proportion of 1:3. Certain aldehydes such as salicylaldehyde and vanillin have already been detected in soils by other workers, and the author has now investigated the influence of six aldehydes, salicylaldehyde, vanillin, hellotropan, benzaldehyde, formaldehyde, and paraformaldehyde on the growth of plants in water and in nutrient-culture solutions, and of the first two named aldehydes in pot and field trials. Sixty-six culture solutions were used containing varying proportions

of sodium nitrate, calcium superphosphate, and potassium sulphate, always prepared so as to contain 80 parts per million of $P_2O_5 + NH_3 + K_2O$. All of the aldehydes were found to be harmful in aqueous solutions in comparatively small amounts. Salicylaldehyde was less harmful when the solutions contained a high percentage of phosphate and its effect was lessened somewhat by the presence of calcium carbonate. Vanillin was less harmful than salicylaldehyde. It affected the roots more severely than the tops of the plants. Its harmful effect was much lessened by the presence of sodium nitrate in considerable amount. Benzaldehyde when present to the extent of 25 parts per million was injurious to plant growth. There was no very marked beneficial influence exerted by any one of the nutrient salts. Heliotropin was much more harmful than benzaldehyde and the plants were so severely injured that it was difficult to differentiate its effects in the different solutions. Formaldehyde was equally harmful in the different nutrient solutions. Paraformaldehyde was also harmful, but phosphates have a marked ameliorating action on its effect. From the pot and field trials it was found that the two aldehydes examined, salicylaldehyde and vanillin, had no harmful action on well-drained, good productive soils in a high state of cultivation, which, when examined in the laboratory, were found to possess good oxidising power. Further in these soils the aldehydes disappeared. The soils in which the added aldehydes were found to have a harmful effect had a lower crop-producing power and their general management had not been so good. The aldehydes remained in these soils. In these latter soils lime and manganese greatly aided in lessening the effects of both aldehydes, phosphates ameliorated the harmfulness of salicylaldehyde and nitrate of vanillin. Unfertile soils, poor owing to the presence of aldehydes, can be made productive by good drainage and by the use of lime and of certain fertilisers.—W. G.

"Alkali" content of soils as related to crop growth.
F. T. Shutt and E. A. Smith. Trans. Roy. Soc. Canada, 1918, 12, 88—97. (Reprint.)

As a commencement towards the establishment of standards as regards safe limits of "alkali" in soils, adapted to Canadian conditions, the authors have determined the alkali content in the layers 0"—6", 6"—18", 18"—36", and 36"—60" in depth in soils of the same type on which there was respectively good growth, poor growth, and no growth for crops of western rye grass, native prairie grass, oats, wheat, and onions respectively. The limits of toxicity of total saline content are found to vary considerably with the crop.—W. G.

Soil samples; Are unusual precautions necessary in taking — for ordinary bacteriological tests?
C. B. Lipman and D. E. Martin. Soil Sci., 1918, 6, 131—136.

In taking samples of soil it has been usual to take special precautions to collect samples under "aseptic" conditions, such as the flaming of the surface of a vertical wall of soil. This method was compared with sampling by means of an auger, and it was found that there was no significant dissimilarity in bacteria numbers, ammonifying power, nitrification, and nitrogen fixation between samples taken by the two methods. Incidentally it was noticed that bacteria penetrated to a much greater depth in arid soil than in humid soil. From 2 ft. below the surface to 6 ft. there was little difference in the number of bacteria and bacterial activity.—J. H. J.

Liming [soils]; Effect of — on crop yields in cylinder experiments. J. G. Lipman and A. W. Blair. Soil Sci., 1918, 6, 157—161.

THREE sets of experiments were made, alike in all respects except that in one sodium nitrate, in another ammonium sulphate, and in the third dried blood was added. The experiments covered two periods of ten years each, with a five-year rotation of crops. Each set received a good supply of lime at starting, and during the second period cylinder A in each set received no more lime, cylinder B received lime, and cylinder C received lime and a leguminous green manure. The weight of the dry matter in the crop in each year was ascertained. It was found at the end of the first period that there was little difference between the cylinders of each set. At the end of the second period, the yield in cylinder A had fallen off, while that in cylinder B had increased, and that in cylinder C had increased still more. These results show the importance, where commercial fertilisers are used, of the application of lime at the same time, and also the importance of increasing the supply of available nitrogen by the introduction of a leguminous crop in the rotation.—J. H. J.

Mould action in the soil; Importance of —.
S. A. Waksman. Soil Sci., 1918, 6, 137—155.

MOULDS have been isolated in large numbers from cultivated and uncultivated soil, and the identity of many has been established. By the growth of their mycelia in the soil, transformation of the organic and inorganic constituents is effected, but no nitrification nor nitrogen fixation. Decomposition of nitrogenous organic matter takes place with production of ammonia, the amount depending on the source of the nitrogen and the carbohydrates available. The carbohydrates are decomposed with production of carbon dioxide. Nitrogenous fertilisers are utilised to form protein which is taken up by the plant; this is returned to the soil, however, when the body of the plant undergoes autolysis. Much enzyme action in soil is due to moulds; also much acid production. Many species are parasitic to green plants. (See also J. Chem. Soc., Feb., 1919.)—J. H. J.

Soya beans; Effect of inoculation, fertiliser treatment, and certain minerals on the yield, composition, and nodule formation of —. C. R. Fellers. Soil Sci., 1918, 6, 81—129.

From pot and field experiments it was found that inoculation of soya-bean seeds before planting or of the soil in which they were planted with pure and commercial cultures of *B. radicola* or with well infected soil caused a substantial increase in the crop. The protein content of the crop increased and the oil content decreased in direct proportion to the thoroughness of the infection. There appeared to be little natural spreading of the nodule organism in the soil, apart from its transference by outside agency, as water, air, etc. In acid soils the application of small quantities of lime was as important as inoculation, and stimulated nodule formation enormously. The protein and oil content were affected as before. Small applications of acid phosphate (superphosphate) were also beneficial, and in this case oil production was increased when the phosphate was applied after liming. Potash was beneficial to a less extent. Sodium nitrate inhibited nodule formation, and soya beans do not appear to require soluble nitrogen compounds. Manganese had little effect, and sulphur was somewhat injurious.—J. H. J.

Nitre-cake; Utilisation of — in the manufacture of superphosphate. F. T. Shutt and L. E. Wright. Roy. Soc. Canada, May, 1918. Canadian Chem. J., 1918, 2, 314–316.

FINELY ground Florida pebble phosphate (total P_2O_5 , 32.3%) and Canadian apatite (total P_2O_5 , 36.4%) were separately mixed with powdered nitre-cake (60-mesh, containing 30% free sulphuric acid) in various proportions, in the dry and moist conditions, and the mixtures were allowed to stand at atmospheric temperature for periods up to one week. From the results obtained it is concluded that either phosphate could be converted into superphosphate containing 7–9% of available phosphoric acid (as determined by the methods of the American Association of Official Agricultural Chemists) by the method indicated, the only apparatus required being that necessary for grinding and mixing the materials.—W. E. F. P.

PATENTS.

Fertiliser; Production of an available phosphoric anhydride and potash — R. F. Gardiner, Clarendon, Va. U.S. Pat. 1,282,805, 29.10.18. Appl., 29.5.18. (Dedicated to the public.)

PHOSPHATIC and potash minerals are mixed with calcium chloride and sawdust, or other wood waste, and heated at a bright red heat.—J. H. J.

Fertiliser; Process of manufacturing — [from blast-furnace flue-dust]. J. H. Connor, Sharpsburg, Pa. U.S. Pat. 1,283,677, 5.11.18. Appl., 23.9.14.

BLAST-FURNACE flue dust containing iron and potassium is mixed with "salt residue" and the mixture calcined to convert the potassium into a soluble form.—J. H. J.

Fertiliser, etc.; Process of making artificial — J. H. Connor, Pittsburgh, Pa. U.S. Pat. 1,283,678, 5.11.18. Appl., 27.4.16.

A TOBACCO product, bone calcium phosphate, and an alkaline reagent are digested in a vat under steam pressure; the liquid is drawn off and evaporated. The mixture may be made up also from a tobacco product, nitrogenous organic matter, flue dust, and an alkaline reagent.—J. H. J.

Fertiliser from sewage-sludge. U.S. Pats. 1,284,441 and 1,284,442. See XIXe.

XVII.—SUGARS; STARCHES; GUMS.

Starch glucose; Determination of — in molasses by polarisation at 87° C. L. E. Johnson. Lab. Inland Rev. Dept., Ottawa, Bull. 407, 1918. Int. Sugar J., 1919, 21, 40.

MIXTURES of pure cane molasses with increasing amounts of starch glucose were examined by polarising at 87° C. after inversion of the sucrose, an allowance being made for the dextro-rotation which molasses always exhibits at 87° C. after inversion, this being found to amount to +3.02° V. (average for 13 samples). The Leach method (U.S. Bureau of Chemistry, Bulletin 81, p. 73) was also tested, the calculation being made by the formula $\frac{(P-S)100}{175}$, in which P is the direct polarisation, and S the sucrose by double polarisation.

It is concluded that approximate results may be obtained by the method of polarising at 87° C., but that the Leach method cannot be used when there are considerable amounts of invert sugar

present, as is the case with cane molasses, some of the results obtained being as follows:

	5% Sample straight	10% Glucose added	20% Glucose added	30% Glucose added
Reading at 87° C. ...	+4.0	+7.84	+13.14	+30.56
Calculated glucose ...	2.15	4.81	8.26	18.76
Calculated glucose, using Leach formula, polarising at 20° C.	—	—	4.98	15.26

—J. P. O.

Reducing sugars; Volumetric determination of — W. B. Clark. J. Amer. Chem. Soc., 1918, 40, 1759–1772.

A MODIFICATION of Scales' method (this J., 1915, 1264) is described, the principal feature of which is that the reduced copper is estimated directly by titration in the same solution in which it was precipitated. Unlike Scales, who used Fehling's solution, the author uses a modified Benedict solution (this J., 1907, 1102; 1911, 439) and carries out all the operations in one vessel. A copper-citrate-carbonate solution is used containing 16 grms. of copper sulphate crystals, 150 grms. of sodium citrate crystals, 130 grms. of anhydrous sodium carbonate, and 10 grms. of sodium bicarbonate per litre. The reduction is carried out under conditions which must be standardised exactly, according to the amount of sugar to be estimated. The solution is heated to boiling in 4 mins., and the boiling continued another 2 mins. The reduced copper is dissolved by the addition of strong hydrochloric acid sufficient to give a distinct acid reaction, and oxidised by addition of a slight excess of 0.1 or 0.04N iodine solution. The excess of iodine is then titrated with standard 0.04N thiosulphate. The thiosulphate is standardised under the same standard conditions. The ratio of copper to reducing sugar is fairly constant, except for small quantities of sugar. The author considers it better for each worker to standardise his own conditions rather than to use tables drawn up for a set of conditions which he may not be able exactly to fulfil. Duplicate results carried out by this process differ by less than 0.25 mgrm. of reducing sugar, and four determinations can be made in an hour. Sucrose in amounts not exceeding 100 mgrms. per 10 c.c. and 50% ethyl alcohol has no reducing action on the citrate-carbonate solution, but 10% formaldehyde has a small reducing action.—E. H. R.

Aldopentoses; Crystallography and optical properties of three — E. T. Wherry. J. Amer. Chem. Soc., 1918, 40, 1852–1858.

CRYSTALS of the three sugars α -D-lyxose, α -D-xylose, and β -D-arabinose have been carefully examined and it is found that the differences between their optical properties are sufficient to serve as a means of identification. A determinative table for this purpose is given. The sugar is immersed in an oily liquid with refractive index $n=1.53$ and examined in a refractometer in yellow light with the polarising nicol in and the diaphragm partly closed. With α -xylose, one refractive index is decidedly lower than that of the liquid; between crossed nicols colours of the 2nd or 3rd order are shown; and in convergent light interference figures are frequently observed. With α -lyxose, one index is about equal to that of the liquid; 1st or 2nd order colours are shown between crossed nicols; and interference figures are rarely observed in convergent light. With arabinose, all indices are decidedly higher than that of the liquid; 2nd order colours are mostly shown between crossed nicols; and interference figures are rarely observed in convergent light; the lowest index of α -arabinose is less and that of β -arabinose greater than 1.553. (See also J. Chem. Soc., 1919, 1, 65.)—E. H. R.

Corn [maize] cobs; Preparation of several useful substances [gum, sugars, and acetic acid] from —. F. B. La Forge and C. S. Hudson. *J. Ind. Eng. Chem.*, 1918, 10, 925–927.

THE disintegrated cobs are first heated with water at 140° C. under pressure; the aqueous extract, when evaporated, yields an adhesive gum (about 30% of the weight of the cobs). The extracted cobs are then heated with 1.75% sulphuric acid at 130° C.; the acid extract yields about 5% of acetic acid when distilled, and the residue, on concentration, gives 5% of crystallised xylose. The cellulose residue remaining after these treatments is treated with an equal weight of 75% sulphuric acid for 6 hrs., the mixture then diluted with water, boiled for 1 hr., neutralised with lime, filtered, and concentrated to obtain dextrose; the yield of the latter is about 37% of the weight of the dry cobs.—W. P. S.

Starch; Preparation of soluble —. A. Leulier. *J. Pharm. Chim.*, 1918, 18, 291.

A MIXTURE of wheat, rice, or maize starch, 25, alcohol (95%), 100, and sulphuric acid, 5 grms., is boiled for 15 mins. under a reflux condenser; the starch is then collected on a filter and washed with water until free from acid. If it is desired to dry the starch rapidly, it may be washed with alcohol in place of water. The product is readily soluble in hot water and the solution gives a clear blue coloration with iodine.—W. P. S.

PATENTS.

Dextrin; Process of manufacturing —. W. McLaurin, Brookfield, Mass. U.S. Pats. (A) 1,283,839 and (B) 1,284,120, 5.11.18. Appl., (A) 20.7.15 (renewed 27.4.18) and (B) 22.6.16.

(A) COMMERCIAL pure starch is treated with an equal quantity of water and a quantity of acid materially less than 1% of the weight of the starch, in a closed vessel in which the mixture is subjected to the indirect action of steam at a temperature of about 280° F. (138° C.) and under a corresponding pressure, until the starch is uniformly converted into dextrin in the form of a colourless solution which is liquid at 60°–70° F. (15°–21° C.). (B) A clear, ready-dissolved dextrin solution of about 50% concentration, suitable without further treatment as a coating, adhesive, or impregnating material for paper, textiles, or the like, of uniform quality throughout, and containing less than 10% of sugar calculated on the weight of the dry product, is prepared from commercially pure starch, e.g., as described under (A). —J. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Phosphoric acid; Volumetric determination of — in brewing materials. W. Wöllmer. *Z. ges. Brauw.*, 1918, 41, 145–147.

DETAILED procedure is described for applying the method of titration with alkali, using two indicators (*cp. Smith*, this J., 1917, 415; *Fiehe and Stegmüller*, 1912, 943) to the determination of phosphoric acid in the ash of barley, malt, wort, or beer. The ash, after evaporation to dryness several times with hydrochloric acid on a water-bath, is dissolved in 1 c.c. of dilute hydrochloric acid and filtered. The filtrate and washings, which should occupy 20–30 c.c. and contain not more than 70 mgrms. PO₄, are treated with a drop of 0.1% methyl orange solution and exactly neutralised with sodium hydroxide, a concentrated solution of the latter being used except for the final adjustment. Thirty c.c. of 40% calcium chloride solu-

tion, exactly neutral to phenolphthalein, is then added, and the liquid is heated just to boiling, cooled to about 14° C., treated with 2 drops of 1% phenolphthalein solution and titrated, whilst being continuously agitated, with N/10 sodium hydroxide solution free from carbonate. After a red coloration has been attained the liquid is allowed to stand at 14° C.; the colour is slowly discharged and after 2 hours the titration is completed. The total volume of N/10 sodium hydroxide used is reduced by 1% to allow for traces of carbonate unavoidably present; 1 c.c. corresponds with 3.55 mgrms. P₂O₅. The method gives sufficiently accurate results with the materials named above, but is vitiated by the presence of considerable quantities of iron, alumina, manganese, or borates. —J. H. L.

Malting and a new process for the reduction of malting loss. C. A. Nowak. *Pure Products*, 1918, 14, 219–223. *Bull. Agric. Intell.*, 1918, 9, 1241–1242.

CLEANED barley is soaked in steeping vats and air is passed through the water, no lime being added. In hot weather, bleaching powder is added to give 0.034% of chlorine in the water. After steeping, the barley is spread on the floor and sprinkled with a 0.1–0.4% solution of phosphoric acid. After the acrospire has sprouted sufficiently, the malt is put on the kiln. The use of phosphoric acid has a stimulating effect on the grain, enabling the germination period to be shortened by 24 hrs. The process produces a malt which gives 1% more extract than ordinary malt and an increase in acidity of 0.018% of the total acid.—J. H. J.

Mashing process; The Plesch —. G. Fries. *Z. ges. Brauw.*, 1918, 41, 73–75, 81–83.

THE author describes the working of this process, which is one of many mashing methods proposed during the war in Germany with a view to economising material, fuel, and time. It involves the following operations:—cold digestion of the finely ground malt overnight; withdrawal of a portion of the cold water extract for future use; peptonisation and saccharification of the mash; addition of hops (previously ground and digested with cold water) to the mash; boiling of the hopped mash; filtration of the hot mash; cooling of the filtered wort and saccharification of any starch therein by addition of the cold malt extract previously reserved; destruction of diastase by heating the saccharified wort to boiling. The wort is then cooled and fermented as usual. The author points out that, apart from the addition of hops to the mash, the process differs little from the Schmitz method of mashing (this J., 1898, 261). The results were fairly satisfactory; the wort deposited only a small quantity of sludge on the cooler but developed a slight turbidity which necessitated the use of a filter-press. The dark beer produced was of good quality, but the economies claimed on behalf of the process have been greatly exaggerated. It is claimed that if the malt is very finely ground the wort from the boiled mash will require no further saccharification, but the author considers that the continued production of such a fine grist is beyond the capacity of any known malt mills. —J. H. L.

Mashes and worts; Colloidal transformations in the boiling of — by direct flame and by steam. A. Reichard. *Allg. Brauer- u. Hopfenzeit.*, 1918, *Z. ges. Brauw.*, 1918, 41, 141–143.

IN the boiling of brewery mashes and worts the temperature of the floor of the copper or other vessel is practically the same, about 120°–130° C.,

whether heating is effected by direct flame or steam jacket. The author describes experiments which confirm the view that these two methods of heating differ somewhat in their effects on the wort. Two series of laboratory mashings and wort boilings were carried out in metal beakers under similar conditions except that heating was effected in one case by direct flame and in the other by a water- or brine-bath. In mashing, the former method of heating, as compared with the latter, led to more rapid saccharification and brighter worts, and in some cases to higher sugar-content and acidity of the worts. In wort boiling also, heating by direct flame resulted in improved "break," higher wort acidities, and more complete emulsification of hop resins. To account for these differences the author suggests that, even where the two methods of heating produce the same temperature in the mash or wort, the direct flame provides a surplus of radiant energy which is expended as work in the modification of colloidal complexes, viz., subdivision of particles of colloids such as hop resins and enzymes, thus promoting contact of the latter with their substrates.—J. H. L.

Nuclein-content of yeast; Determination of — C. A. Lubsen. Pharm. Weekblad, 1918, 55, 1625—1628.

JEKINK's method of determining nucleins consists in hydrolysing the material by means of pepsin and hydrochloric acid, using a solution containing 0.20% HCl; the insoluble residue consists of the nuclein, which is estimated by means of a phosphorus determination. This method has been criticised by Grijns, who states that by long digestion with hydrochloric acid solution containing more than 0.1% HCl, the nucleins are partially dissolved, and therefore low results are obtained. The author has carried out experiments to test the validity of this criticism, using yeast, and finds that Jekink's method gives accurate results even when solutions containing as much as 0.35% HCl are used. (See also J. Chem. Soc., Feb., 1919.) —S. I. L.

Yeast; Dependence of maltase-activity on the state of development of — F. Schönfeld, H. Krumhaar, and M. Korn. Woch. Brau., 1918, 35, 175—176. (See also this J., 1918, 161 A, 779 A.)

THE authors determined the maltase-activity of brewers' yeast taken from the vat at different stages of the primary fermentation. The maltase activity of the yeast was found to increase to more than twice its original value as the intensity of fermentation rose to its maximum, and to decline again at the close of fermentation. It is suggested that yeast taken from the vats at the most vigorous stage of the primary fermentation might be added to beer at the commencement of storage to stimulate the secondary fermentation, since it possesses greater maltase- and zymase-activities than the yeast which normally remains in the beer on leaving the vats.—J. H. L.

Yeast; Influence of wort concentration on the biology of — H. Zikes. Allg. Z. Bierbr. u. Malzfabr., 1918, 46, 21. Z. ges. Brauw., 1918, 41, 135—136.

THE author enumerates the degenerative effects of cultivation of beer yeast in worts of very low gravity, e.g., 3°—5° Balling. The fermentative and reproductive functions are impaired. The cells become smaller and tend to assume abnormal forms (cp. Schönfeld and Goslich, this J., 1918, 779 A). The number of vacuoles and granules (fat globules) increases, and the formation of glycogen is less active than in strong worts. The Schlichting-Winther method of staining with methylene blue gives direct evidence of degeneration.—J. H. L.

Yeast from war beers; Dark colour of — H. Will. Z. ges. Brauw., 1918, 41, 181—183.

THE yeast obtained in the production of thin war beers in Germany is often abnormally dark in colour. This is due to contamination with substances—coagulated protein and gluten particles—derived from the wort, which are found also, though in smaller amounts, on yeast from beers of normal gravity. The relatively large amounts found on war yeasts are mainly due to the fact that these substances separate from worts of low gravity in a very finely divided state and remain suspended for a long time, so that the worts on entering the fermentation vats still contain a considerable quantity which is ultimately deposited on the yeast cells.—J. H. L.

Beers; Carbon dioxide-content of thin — F. Schönfeld and C. Goslich. Woch. Brau., 1918, 35, 167—168.

THE solubility of carbon dioxide in beer decreases by 0.01% for a rise of 1° C., and by 0.015% for a fall of 0.1 atm. pressure. It diminishes also with decrease in the content of sugars, dextrins, alcohol, and other constituents which contribute to the viscosity of beer, and is therefore lower for thin beers than for those of normal gravity. This difference may be compensated by storing thin beer under a relatively high pressure, but when the pressure is released there is apt to be a too copious evolution of gas from the beer. The retention of gas by beer is favoured by absence of suspended matters. In the carbonation of thin beers, the conditions most favourable to retention of the gas are low temperature, high pressure, intimate contact between liquid and gas, and subsequent storage of the beers for several days under a pressure of carbon dioxide. —J. H. L.

Beer; Production of turbidity in thin — by yeasts and bacteria after carbonation with oxygen-containing carbon dioxide. P. Lindner. Woch. Brau., 1918, 35, 225.

IT is suggested that the frequent occurrence of turbidity in German war beers may be due to carbonation with carbon dioxide containing oxygen, which encourages the development of wild yeasts and bacteria.—J. H. L.

Beer; So-called carbohic odour of soured thin — W. Windisch. Woch. Brau., 1918, 35, 240—241.

THE appearance of turbidity of biological origin in thin beers is often accompanied by a peculiar odour incorrectly described as "carbohic." It is probably due to reduction of nitrates present in the brewing water, by the bacteria responsible for the turbidity, and the liberation of free nitrous acid. Yeast washed and stored with water containing nitrates suffers in fermenting power, and such weakened yeast dies if stored in thin beer and acquires a somewhat nitrous odour. It is possible that the weakened yeast itself can reduce nitrates. —J. H. L.

Food value of yeasts. Meyer. See XIXA.

PATENTS.

Sulphite-cellulose liquors. U.S. Pats. 1,284,739 and 1,284,740. See V.

Solvent. U.S. Pat. 1,283,183. See XX.

XIXA.—FOODS.

Wheat and mill products; Capacity of — for moisture. W. L. Stockham. North Dakota Agric. Exp. Stat., Bull. No. 120, 97—131. Bull. Agric. Intell., 1918, 9, 1242—1244.

Wheat has a higher moisture capacity than any of its products; it absorbs 12.4%, whilst "patent" flour absorbs 11.31%, bran 11.17%, "first clear" flour 11.07%, and "second clear" flour 10.86%. The starch prepared from "patent" flour has also a greater moisture capacity than that prepared from "clear" flour. The capacity diminishes with increase of temperature; between 0° and 40° C. the saturation is only from one-third to one-half of the theoretical value, on account of secondary biochemical changes. Sprouting causes wheat to absorb water more rapidly, but the maximum reached is not so high. In the case of the various grades of flour, the absorption capacity varies inversely with the protein content. The effect of storage is to increase the moisture capacity of flour. Gluten absorbs 180% of moisture and retains practically a constant amount at temperatures below its decomposing point. Starch has its moisture capacity doubled by hydrolysis, whereas by dextrinisation it is decreased. The maximum staleness of bread occurs when the ratio of water present in the bread to the moisture capacity of the starch is least. The moisture capacity of the inner portion of a loaf indicates that all the starch is hydrolysed during baking; the moisture capacity of the crust is less, indicating some dextrinisation.—J. H. J.

Bread; Measurement of the acidity of —. E. J. Cohn, P. H. Cathcart, and L. J. Henderson. J. Biol. Chem., 1918, 36, 581—586.

The acidity or hydrogen ion concentration of bread is determined by cutting a loaf cleanly and allowing 4 drops of a 0.02% solution of methyl red in 60% alcohol to fall upon a point near the centre of the loaf. After waiting 5 minutes the colour is compared with a colour chart which permits of the hydrogen ion concentration being read off with a considerable degree of accuracy. It is found that "ropiness" in bread, due to the growth of *B. mesentericus*, cannot develop unless the hydrogen ion concentration is below $p_{\text{H}}=5$.—H. W. B.

Milk; Determination of the fat-free residue of —. N. Schoorl. Pharm. Weekblad, 1918, 53, 1645—1664.

The author gives an exhaustive account of the methods and formulæ used to determine the dried fat-free residue of milk, and discusses the theoretical basis of the simple formula of the type, $R_F = R - F = \frac{S}{a} + \frac{F}{b}$, in which R_F is the dry fat-free residue in grms. per 100 c.c., R the total residue, F the fat, S the excess of the specific gravity over 1.000, multiplied by 1000, and a and b constants depending on the specific gravity of the fat-free residue and of the fat. Constant additive terms may be included (as in the formulæ of Droop Richmond and van Herz) to make the formulæ agree better with determined values. The employment of the formulæ is considered in relation to the accuracy of the experimental methods. The accuracy of the ordinary determination of the sp. gr. of milk, for example, does not extend beyond the third decimal figure; a difference of 0.001 in the specific gravity corresponds to a difference of 0.25% in the calculated value for fat-free residue. In the direct determination of the residue, the various materials used for taking up the milk before evaporation give different results; sand is probably most suitable

since it absorbs least moisture on exposure to air. The milk-residue itself absorbs moisture very readily, even whilst being weighed, and to allow for this, several weighings should be made at definite intervals, a curve plotted, and the true weight determined by extrapolation. In a series of experimental determinations of the dry residue of a sample, it was found that the possibility of error amounted to 0.5%. The results of direct determination of the residue are compared with the results obtained by the various formulæ, and it is shown that only when an exact definitive procedure is followed can uniform results be obtained. It is suggested that the simple formula of Meslinger,

$$R_F = \frac{S + F}{4}$$

should be employed, and a method of direct determination laid down to give results which shall agree with those obtained by calculation. The importance of the determination of the fat-free residue as a criterion is discussed, and the procedure of A. Mayer and Droop Richmond is recommended; the advantage of using the specific gravity of theoretically fat-free milk as a standard is pointed out.—S. I. L.

Milk; Reducing enzymes of —. J. Perriraz. Arch. Sci. Phys. et Natur., 1918, 46, 101—102. Bull. Agric. Intell., 1918, 9, 1250—1251.

Milk was sampled at the byre and 10 c.c. was treated with ammonium nitrate and acetaldehyde and incubated at 60° C. for 1 hour. The serum was filtered off, and re-filtered after addition of basic lead acetate. The nitrite in the clear filtrate was titrated with standard sulphanilic acid and naphthylamine acetate. The results of these experiments showed that a very minute quantity of a reducing enzyme was present, depending upon the animal species, the age, and the food. At the beginning of milking the enzyme is almost absent, whilst towards the end it increases greatly. Boiling causes the enzyme to disappear completely, so that sterilised milk has lost a very important element in its digestibility.—J. H. J.

Curd and whey proteins; Method of differentiating —. A. Beythien and P. Pannwitz. Z. Unters. Nahr. Genussm., 1918, 36, 145—152.

The method depends on the solubility of curd (casein), and on the practical insolubility of whey proteins, in calcium hydroxide solution; whey proteins, however, when made into cheese and ripened, yield a considerable quantity of soluble protein, and a preliminary treatment is necessary in order to remove these soluble proteins. From 5 to 6 grms. of the well-mixed sample, e.g., cheese, is ground to a thin paste with water and heated at 40°—50° C. for 90 mins.; after cooling, the mixture is diluted to 200 c.c., filtered, and the nitrogen determined in the filtrate. This gives a measure of the degree of ripening. The insoluble portion on the filter is then washed with cold water, and pressed. The nitrogen is determined in a portion (1 to 2 grms.), whilst the remainder (3 to 4 grms.) is heated at 40°—50° C. with about 90 c.c. of saturated calcium hydroxide solution for 90 mins.; after cooling, the mixture is diluted to 100 c.c., filtered, and the nitrogen determined in the filtrate. If the whole of the nitrogen is soluble in calcium hydroxide solution, the sample consists of curd cheese; if only about 5%, or less, is soluble, the cheese was made from whey proteins.—W. P. S.

Potatoes; Solanin content of —. A. Behre and H. Ehrecke. Chem.-Zeit., 1918, 42, 593.

WHILST good-grade potatoes contain only traces of solanin and ordinary market potatoes a very small

quantity, potatoes which have turned green by exposure to air and sunlight may contain up to 0.019%; the solanin is concentrated in the green portions. Two kilos. of these green potatoes would contain a quantity (0.3 gm.) sufficient to produce poisonous effects.—W. P. S.

Banana flour and other flours from tropical starchy products. B. J. Eaton. Agric. Bull. Fed. Malay States, 1918, 6, 430—436.

BANANA flour has the following percentage composition: moisture, 9—12; fat, 0.32—0.44; protein, 3.0—4.8; fibre, 0.7—0.8; starch, 77—83; glucose, 0.9—1.8; ash, 1.8—2.3; phosphate (P_2O_5), 0.13—0.17. The protein content is thus very low. In the tropics the substitutes for wheat flour consist chiefly of flours prepared from cassava, yams, sweet potatoes, and sago. All of these consist essentially of starch with little or no protein. Banana flour is prepared by peeling the fruit, cutting it into slices, and exposing to the sun for 2—3 days. The dried slices are crushed in a mill and sifted through fine muslin. A banana crop removes 123 lb. of potash, 12.5 lb. of phosphate, and 43.7 lb. of nitrogen per acre from the soil, and in addition the stalks left on the ground contain 150 lb. of potash, 6 lb. of phosphate, and 41.4 lb. of nitrogen. In manuring, potash may be applied as sulphate, phosphate as basic slag or superphosphate, and nitrogen as dried blood or calcium nitrate.—J. H. J.

Brewers' yeasts; Food value of various —, and the new so-called "mineral yeast." D. Meyer. Landw. Wochenschr. Sachsen, 1916 [45]. Bied. Zentr., 1918, 47, 189—190.

THE composition of three specimens of dried brewers' yeast was compared with that of the so-called mineral yeast prepared by Delbruck's process. The former contained 52.7% of crude protein and the latter 50.9% reckoned on an ash-free basis. The figures for pure "protein" were 38.6 and 37.2, and for non-nitrogenous substances, including fat and fibre, 27.9 and 25.1 respectively. The mineral yeast yields 18.3% of ash consisting chiefly of calcium phosphate, whilst brewers' yeast yields only 7.9% composed of alkali phosphates.

—H. W. B.

Proteins; Compounds derived from — by energetic treatment with nitric acid. VII. C. T. Mörner. Z. physiol. Chem., 1918, 103, 80—83.

THE suggestion of Knoop (Z. physiol. Chem., 1918, 101, 210) that the acid substances discovered by Mörner (ibid., 1917, 101, 15) amongst the oxidation products of protein were 5-nitroglyoxaline-4-carboxylic and glyoxaline-4-carboxylic acids has been found to be correct.—H. W. B.

Peanut, Arachis hypogaea; Proteins of the —. III. Hydrolysis of arachin. C. O. Johns and D. B. Jones. J. Biol. Chem., 1918, 36, 491—500.

ARACHIN contains 16.7% of glutamic acid. It resembles kafirin (see this J., 1917, 155) in containing tryptophan, but no glycine. (See further J. Chem. Soc., Feb., 1919.)—H. W. B.

Baking powders; Analysis of phosphate —. L. Wolfmum and J. Pinnow. Z. Unters. Nahr. Genussm., 1918, 36, 129—144.

THE available carbon dioxide in baking powders having an acid phosphate as their acid ingredient is best determined by boiling the sample in a Geissler apparatus; the alkalinity of the mixture after reaction has taken place is not a measure of the excess of sodium bicarbonate present. This

latter must be calculated from the total amount of sodium in the sample, after making allowance for that combined with chlorine, sulphuric acid, and available carbon dioxide.—W. P. S.

Rancidity of fats. Prescher. See XII.

Soya beans. Fellers. See XVI.

Substances from maize cobs. La Forge and Hudson. See XVII.

Nuclein in yeast. Lubsen. See XVIII.

PATENTS.

Potatoes; Preparing — for dehydration. M. F. Mangelisdröff, Union Hill, N.J., U.S.A. Eng. Pat. 121,405, 21.2.18. (Appl. 3145/18.)

POTATOES, with the skins and eyes removed, are sliced in a cutting machine and then passed through a horizontal cylindrical casing in which the slices are turned over and exposed to the action of steam for a few minutes so as partially to cook them. From the casing they are delivered into a tank of cold water where they are quickly cooled by being moved by a scoop round the tank and lifted gradually to a vertical exit pipe in the centre of the tank. From the exit pipe, they fall on to a perforated belt which conveys them to a dehydrating chamber.—J. H. J.

Semolina; Treatment of —. A. R. Goodwin, Kidderminster. Eng. Pat. 121,408, 4.3.18. (Appl. 3776/18.)

WHEATEN semolina is submitted to the action of steam until it becomes slightly glutinous, care being taken that its granular nature is not destroyed. Flavouring essences in powder form are added to the steamed product, and the mixture is shaken, dried, and sifted.—D. W.

Bread-making composition. H. A. Kohman, Pittsburgh, Pa., C. Hoffman, New Rochelle, N.Y., and A. E. Blake, Pittsburgh, Pa., Assignors to Ward Baking Co., New York. U.S. Pats. (A) 1,282,867 and (B) 1,282,868, 29.10.18. Appl., 10.12.14.

(A) AMMONIUM chloride, either alone or with calcium sulphate, is mixed with flour or other starchy material, and the mixture is used along with yeast in the making of bread. (B) A small proportion of calcium sulphate is mixed with flour or other starchy material, and the mixture is used along with yeast in preparing a dough batch, whereby a still smaller proportion of the calcium salt is incorporated homogeneously in the dough. —J. H. J.

Fruit-juices; Process for preserving —. H. C. Gore, Lakoma Park, Md. U.S. Pat. 1,284,187, 5.11.18. Appl., 17.7.15. (Dedicated to the public.)

FRUIT-JUICE is filtered and treated with a suitable proportion of "absorbent black," which is then filtered off, and the filtrate is treated with infusorial earth and again filtered. The second filtrate is sterilised.—J. H. J.

Dehydrating vegetable substances. Eng. Pat. 121,394. See I.

XIXB.—WATER PURIFICATION; SANITATION.

Water; Adsorption of metals from drinking — by glass. K. Scheringa. Pharm. Weekblad, 1919, 56, 8—9.

It is shown that no diminution occurs in the proportion of metal in dilute solutions of salts after standing for two days in glass vessels which have previously been thoroughly cleansed. The diminution in the lead-content of drinking water on standing cannot therefore be due to adsorption, but must be attributed to chemical causes. (See also J. Chem. Soc., Feb., 1919.)—S. I. L.

Sunlight (total white light and partial or coloured lights); Bactericidal action of —. M. de Laroquette. Ann. de l'Inst. Pasteur, 1918, 32, 170—192. Bull. Agric. Intell., 1918, 9, 1146—1148.

EXPERIMENTS were made at Algiers in the summer of 1914 and the autumn of 1916. Coloured light was obtained by the use of coloured glass. Plants, bacteria, yeasts, and moulds were exposed under various conditions to the action of the sun's rays and it was found that sunlight was only bactericidal with prolonged or direct application, acting particularly on the surface of solid media and on air, in which positions organisms are more exposed to desiccation. In liquid media bacteria are destroyed only at shallow depths and under intense light. Diffused daylight is insufficient, and white light is much more active than any coloured light. Blue light is slightly more bactericidal than yellow, and yellow than red. The luminous part of the solar spectrum is more active than the ultra-violet and the infra-red. The heat of the rays has a certain influence, as cooling with ice during exposure delays the death of the organisms and the drying of the medium. The bactericidal power of the rays seems to be connected with their chemical action and especially their dehydrating action on solid media. The death of bacteria in sunlight appears to be due to too great an absorption of energy, of which the effect is dehydration and coagulation of the protoplasm; the rays with the shortest wave-lengths are the most active on the surface because they are the most largely absorbed by the bacteria and the medium. In practical hygiene in temperate regions, it would be useless to rely on the bactericidal action of sunlight, as it was found to have no effect at a depth exceeding a few millimetres and to be inhibited by thin layers of fat, muscle, and skin.—J. H. J.

Alkali hypochlorite solution. Philibert. See VII.

PATENTS.

Sewage-sludge; Treatment of —. Treatment of sewage-sludge and fertiliser produced thereby. J. W. Phillips, Assignor to A. R. Smart, Chicago, Ill. U.S. Pats. (A) 1,284,441 and (B) 1,284,442, 12.11.18. Appl., 10.4.16.

(A) PHOSPHORIC acid is added to sewage sludge in excess of the quantity required to decompose the metallic soaps and carbonates, and the oily matter which separates is extracted. (B) In the preceding process, sulphuric acid is used as the acid and the mixture is neutralised with phosphate rock before extracting the oily matter.—J. H. J.

Water; Apparatus for purifying —. C. F. Wallace and M. F. Tiernan, New York. U.S. Pat. 1,285,491, 19.11.18. Appl., 26.3.15.

See Eng. Pat. 113,106 of 1916; this J., 1918, 192 A.

Water; Apparatus for and process of treating liquids with gases or purifying —. C. F. Wallace and M. F. Tiernan, New York. U.S. Pat. 1,285,492, 19.11.18. Appl., 26.3.15.

See Eng. Pat. 113,228 of 1916; this J., 1918, 192 A.

Valve; Back-pressure — [for water-purifying apparatus]. C. F. Wallace, New York, and M. F. Tiernan, New Rochelle, N.Y. U.S. Pat. 1,285,493, 19.11.18. Appl., 11.11.16.

See Eng. Pat. 113,198 of 1916; this J., 1918, 192 A.

[*Water-purification; Means for increasing the rate of solubility of gas in a liquid [for use in —].* C. F. Wallace, New York, and M. F. Tiernan, New Rochelle, N.Y. U.S. Pat. 1,285,494, 19.11.18. Appl., 11.11.16.

See Eng. Pat. 113,374 of 1916; this J., 1918, 192 A.

Treating liquids with gases. Eng. Pat. 121,521. See I.

Applying gas to fluids. U.S. Pat. 1,285,496. See I.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Opium analysis. D. B. Dott. Pharm. J., 1918, 101, 318.

In a recent communication by Annett and Singh (this J., 1918, 441 A) it was suggested that the presence of codeine prevents complete precipitation of morphine by the official method according to which the solution of calcium morphinate is decomposed by ammonium chloride. The author points out that whatever may be the solvent influence of codeine on morphine in aqueous solutions, the conditions of the assay process are entirely different, because sufficient ether is added to hold in solution all the codeine possibly present. The claim of Annett and Singh that a higher yield of morphine is obtained when the codeine and other substances are previously removed from the lime solution could not be confirmed. The author has repeated their experiments, using benzene instead of toluene. On shaking the lime solution with benzene a slight precipitate causes the production of a troublesome emulsion which however can be separated after filtering with the aid of the pump. The morphine precipitate obtained after this treatment weighs more and gives higher result by titration than that obtained by the official process, but it is obviously less pure and its alcoholic solution more highly coloured. When the two kinds of precipitate are washed side by side with 80% alcohol saturated with morphine, the preparation from the benzene process yields more soluble matter in the washings and gives a morphine result no higher and sometimes slightly lower than that prepared in the usual way. (See also this J., 1896, 91.)—J. F. B.

Berberine; Extraction of — from "michai" (Barberis Darwinii) and "calafate" (B. buxifolia), in the Argentine. F. Richert. Rev. Centro Estud. Agron. y Vet. Univ. Buenos Aires, 1918, 11, 11—13. Bull. Agric. Intell., 1918, 9, 1194—1195.

In Patagonia the roots of "michai" and "calafate" are powdered and treated with hot water, whereby an aqueous solution of berberine is obtained which is used locally for dyeing mats. The dried powder of "michai" root yields 8.0% of

crystalline berberine after extraction with hot alcohol. In the case of "calafate," when the alcoholic extract is acidified with dilute nitric acid, 35-40% of crystalline berberine nitrate is obtained.—J. H. J.

Podophyllin [; Test for —]. D. B. Dott. Pharm. J., 1918, 101, 318-319.

THE author has devised a test for distinguishing between the resins of *Podophyllum peltatum* and *P. Emodi*, based on their respective solubilities in dilute ammonia. The resin of *P. Emodi* leaves at least twice as much insoluble matter as that of *P. peltatum*. The absolute amount of insoluble matter depends on the proportion of the dilute solution of ammonia used and the time of maceration. Convenient conditions for the test are as follow:—0.5 gm. of resin is treated with 5 c.c. of dilute ammonia and 5 c.c. of water, well mixed by stirring, filtered after 20 minutes, washed, and dried at about 100° C. If the resin has been prepared from the rhizome of *P. peltatum* the residue should not amount to more than 26%, while that from *P. Emodi* will show over 50%.—J. F. B.

Glycyrrhizin; Gravimetric determination of —. A. Astruc and G. Pichard. J. Pharm. Chim., 1918, 18, 289-290.

THREE grms. of liquorice extract, dried previously at 100° C., is dissolved in 30 c.c. of water containing 5 drops of ammonia, the solution is filtered, and 20 c.c. of the filtrate is treated with 2.5 c.c. of sulphuric acid; after 24 hrs., the precipitate is collected on a filter and washed with small quantities of water, using 30 c.c. in all. The precipitate is then dissolved in a few c.c. of ammonia and the filter washed with water containing 5 drops of ammonia per 10 c.c.; the solution is evaporated, the residue dried at 100° C. for 1 hr., and weighed. To the weight found is added 0.04 gm. to correct for the solubility of the glycyrrhizic acid in the wash water.—W. P. S.

Nitroso-β-naphthol; Estimation of —. P. Nicolardot and L. Valli-Douau. Bull. Soc. Chim., 1918, 23, 455-459.

TWO grms. of the material, dried at 35° C., is shaken with 120 c.c. of acetone and after $\frac{1}{2}$ hour the volume is made up to 200 c.c. with water. Of this solution, 100 c.c. is titrated with a 1.5% solution of iron alum; after the precipitate formed flocculates, the iron alum is added slowly and the end-point is ascertained by spot tests with ammonium thiocyanate. The iron alum solution is standardised against pure nitroso-β-naphthol. For a more exact estimation an excess of iron alum is added, the precipitate is allowed to settle over-night, filtered off, washed with cold water until free from iron salts, and then dried at 70° C. and weighed. The factor for converting the weight of precipitate into weight of nitroso-β-naphthol is 0.907.—W. G.

PATENTS.

Synthetic drugs [ephedrine]. E. C. R. Marks, London. From N. Nagai, Tokyo-fu, Japan. Eng. Pat. 120,936, 13.7.17. (Appl. 10,184/17.)

SYNTHETIC racemic N-methylmhydratin (phenyl-methylaminopropanol), resembling the alkaloid ephedrine from the Chinese plant *Ephedra vulgaris*, and having the formula $C_9H_{11}CH(OH).CH(NHCH_3).CH_3$, is prepared by reducing phenyl-nitropropanol in the presence of a solution of formaldehyde. Benzaldehyde and nitroethane are agitated together at the ordinary temperature for several hours in the presence of a small quantity of a solution of a weakly basic substance; the

resulting phenylnitropropanol is separated by means of ether in the presence of aqueous sodium bisulphite, and is then dissolved in dilute alcohol, treated with formaldehyde in molecular proportion, reduced at a low temperature by zinc dust and dilute acetic acid, and the zinc is removed by hydrogen sulphide. The acetate of the base thus obtained may then be converted into the hydrochloride, which is recrystallised from alcohol.

—J. F. B.

Solvent [butyrene] and process of producing the same. H. Hibbert, Pittsburgh, Pa. U.S. Pat. 1,283,183, 29.10.18. Appl., 27.10.15. Renewed, 19.3.18.

A SOLVENT for nitrocellulose and other cellulose esters, composed largely of butyrene, is prepared by fermenting carbohydrates to form a mixture of acids comprising a large amount of butyric acid. The acids are converted into a mixture of the corresponding ketones, the mixture having b.p. 110°-160° C., mainly 120°-145° C., and sp. gr. about 0.8; it distils readily with steam, and is immiscible with water. If desired, the mixture of ketones may be submitted to hydrogenation and the product acetylated.—J. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Gum bichromate process with a new colloid. H. S. Starnes. Phot. J., 1918, 58, 287-293.

IN the gum bichromate process as usually worked there is uncertainty as to exposure, the actinometer readings being unreliable. It is suggested that this is due to the action of light being in two stages; in the first stage the gum-bichromate film is rendered somewhat more easily soluble, in the second stage the usual insolubilising occurs; the relationship between the two stages depends on the colloid. The best results were obtained by using gum senegal in preference to gum arabic and a sensitising solution containing sodium bichromate, alum, and hydrochloric acid, a very thin coating being given. An acid alum solution was used for development, followed by local treatment with a fine stream of water.—B. V. S.

[Photographic] developers; Causes of variation in the Watkins factor for different —. J. C. Kingdon. Phot. J., 1918, 58, 270-280.

IT is shown that the variations in rates of diffusion of different developers are insufficient to account for the variations that occur in the Watkins factors—i.e., the numbers by which the times of appearance of the image must be multiplied to get total times of development. Rates of diffusion were observed in tubes of gelatin jelly, using strips of bromide paper as indicators; as the developer progressed up the tube the portion of the paper showing complete development was preceded by a band, generally red, of partial development, which band was wider for high-factor developers than for low-factor developers. It is suggested that there is for any developer a critical concentration, dependent on its molecular stability, which is the chief factor in determining time of appearance of the image—the lower the critical concentration the shorter the time of appearance; as rates of diffusion are very similar for different developers, total times of development are very similar and the Watkins factors are therefore smaller for longer times of appearance.—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

PATENTS.

Waste acid liquors [from manufacture of explosives]; Concentration or evaporation of —. J. N. Brooke, Halifax. Eng. Pat. 120,951, 8.11.17. (Appl. 16,355/17.)

Waste acid liquors containing nitric acid, from the manufacture of picric acid or like explosives, are passed at atmospheric pressure through a succession of earthenware or vitreous enamelled vessels, and are heated by means of ordinary or superheated steam circulating through coils or the jacketed walls of the vessels or both. The concentrated acid overflows through a pipe into the next vessel or into a trough.—C. A. M.

Nitro compounds. U.S. Pat. 1,253,617. See III.

Wood pulp for nitrating. U.S. Pats. 1,253,113 and 1,253,114. See V.

Solvent [for nitrocellulose]. U.S. Pat. 1,253,183. See XX.

XXIII.—ANALYSIS.

Arsenic; Estimation of minute quantities of —. O. Billeter. *Helv. Chim. Acta*, 1918, 1, 475–498. (Compare this J., 1915, 199.)

The estimation of arsenic in organic substances is effected in the following manner. The organic matter is destroyed by treatment with nitric acid and concentrated sulphuric acid. In the case of urine, the sample is preferably made alkaline with sodium carbonate and concentrated to a syrup; for each 100 c.c. of urine, potassium perchlorate (2 grms.) and potassium sulphate (4 grms.) are added; the mixture is dried at 120° C., and introduced in small portions at a time into a platinum crucible heated to dull redness; when the action has subsided, the mass is heated to tranquil fusion. The arsenic is then separated from other metals by distillation with a mixture of sodium chloride (2 grms.) and potassium bromide (0.2 gm.) for each 20 c.c. of sulphuric acid used or, if the destruction of organic matter has been effected with potassium perchlorate, by treatment with potassium bromide (0.1–0.2 gm.) and sulphuric acid (90%, 6 c.c.). Mercury is completely retained by one distillation, but, if antimony is present, it is necessary to re-distil after addition of 5–6 grms. of sulphuric acid (90%). Hydrochloric acid is eliminated from the distillate by treatment with hypochlorous acid, and the solution is evaporated to dryness. The residue is dissolved in 1 c.c. of sulphuric acid (12%) and evaporated on the water bath to destroy any chloric acid present, and after addition of water (0.85 c.c.) it is transferred to a Marsh apparatus. By this method 0.01 mmgrm. of arsenic may be detected. Detailed instructions are given for the preparation of the reagents in the requisite degree of purity. (See also *J. Chem. Soc.*, 1919, II, 32.)—H. W.

Calorimetric lag. W. P. White. *J. Amer. Chem. Soc.*, 1918, 40, 1858–1872.

A GENERAL and mathematical discussion of thermal lag effects, particularly in the case of bodies external to the calorimeter. The principal effect of such lag is equivalent to a change in the heat capacity of the calorimeter. A thin metal shield

midway between calorimeter and jacket has an effective heat capacity only one-quarter its actual capacity. Such a shield can often be used advantageously to reduce thermal leakage, and is specially useful as a cover to prevent evaporation. (See also *J. Chem. Soc.*, Feb., 1919.)—E. H. R.

Calorimetric precision; Conditions of —. W. P. White. *J. Amer. Chem. Soc.*, 1918, 40, 1872–1886.

Most calorimetric errors come in the determination of the thermal leakage or cooling correction. The usual practice of diminishing the thermal head (difference of temperature between calorimeter and environment) is not so important as diminishing the thermal leakiness of the calorimeter. The errors due to lags can be largely eliminated. Stirring must be as regular as possible, as the heat produced by stirring varies as the cube of the speed. The type of stirrer used and design of the calorimeter with reference to stirring are important. (See also *J. Chem. Soc.*, Feb., 1919.)—E. H. R.

Calorimetric methods and devices. W. P. White. *J. Amer. Chem. Soc.*, 1918, 40, 1887–1898.

The general rules for calorimetric precision are applied to the consideration of jacket covers and stirrers, and special devices such as vacuum-jacketed vessels, the adiabatic method, aneroid or dry calorimeters, double or differential calorimeters, and the measured-shield calorimeter, a new device in which a thin metal shield is placed between the jacket and calorimeter, and connected to the jacket wall by thermo-elements which are used to measure the thermal head. The advantages of the different types of calorimeter are compared.—E. H. R.

Gases; Quantitative analysis of small quantities of —. H. M. Ryder. *J. Amer. Chem. Soc.*, 1918, 40, 1656–1662.

A SOMEWHAT complicated apparatus is described by means of which a quantitative analysis of 5 cub. mm.—1 c.c. of a gaseous mixture of water vapour, carbon dioxide, carbon monoxide, oxygen, hydrogen, nitrogen, and methane may be carried out with an accuracy of about 5% for each constituent.—J. F. S.

Density of gases; An accurate method for measuring the —. O. Maass and J. Russell. *J. Amer. Chem. Soc.*, 1918, 40, 1847–1852.

The principle of the method, which is applicable to gases which can be condensed in liquid air or some other refrigerating agent, is as follows. A large evacuated glass bulb of known volume is filled with the gas and the pressure and temperature are recorded. The bulb is then connected to a small evacuated bulb immersed in liquid air, the gas condensing in the bulb, which is sealed off and weighed, and again weighed after being broken open and emptied. The weight of the gas is thus determined, the volume being obtained from the volume of the large bulb less that of the gas left behind after the bulb has been sealed off. By this method the following densities were determined: acetylene, 1.1695; methyl ether, 2.1103; hydrogen bromide, 3.6397. (See also *J. Chem. Soc.*, Feb., 1919.)—E. H. R.

Zirconium phosphate; Precipitation of —. G. Steiger. *J. Wash. Acad. Sci.*, 1918, 8, 637–639.

IN the case of average rocks containing only small amounts of zirconium results of sufficient accuracy may be obtained without special precautions by

assuming that the ignited precipitate of zirconium phosphate has the composition ZrP_2O_6 , but in determining larger quantities of zirconium the influence of the acidity of the solution on the composition of the precipitate is important. The solution is oxidised with hydrogen peroxide to prevent the precipitation of titanium, and treated with 3 to 5% of sulphuric acid, and the zirconium precipitated with constant stirring by means of microcosmic salt. After standing overnight the precipitate is separated, washed, ignited, and weighed. The acidity of the solution prevents the simultaneous precipitation of iron and titanium; phosphates of other metals, except those of the rare earths, are readily soluble, and may be separated from the acid filtrate. (See also J. Chem. Soc., Feb., 1919.)—C. A. M.

Heavy and middle tar oils. Weiss. See III.

Benzols and light oil. Weiss. See III.

Phenol and cresols. Dawson and Mountford. See III.

Alkali hypochlorite solution. Philibert. See VII.

Hypophosphites and phosphites. Boyer and Bauzil. See VII.

Rancidity of fats. Prescher. See XII.

Estimating metastable rubber. Dubosc. See XIV.

Tanning materials. Griffith. See XV.

Chrome tanning liquors. Smith and Enna. See XV.

Chrome tanning liquors. Harvey. See XV.

Sulphide in lime liquors. Hayes. See XV.

Glucose in molasses. Johnson. See XVII.

Reducing sugars. Clark. See XVII.

Aldopentoses. Wherry. See XVII.

Soluble starch. Leulier. See XVII.

Phosphoric acid in brewing materials. Wöllmer. See XVIII.

Nuclein in yeast. Lubsen. See XVIII.

Acidity of bread. Cohn and others. See XIXA.

Fat-free residue of milk. Levy. See XIXA.

Curd and whey proteins. Beythien and Pannwitz. See XIXA.

Baking powders. Wolfrum and Pinnow. See XIXA.

Opium analysis. Dott. See XX.

Podophyllin. Dott. See XX.

Glycyrrhizin. Astruc and Pichard. See XX.

Nitroso-β-naphthol. Nicolardot and Valli-Douau. See XX.

PATENTS.

Pyrometry; Apparatus for optical —. I. B. Smith, Ambler, Pa., Assignor to Leeds and Northrup Co., Philadelphia, Pa. U.S. Pat. 1,282,967, 29.10.18. Appl., 6.3.18.

AN optical pyrometer comprises a frame carrying at one end a tube with closed end (serving as a black body), which is presented to the object of which the temperature is to be measured, and at the other end an optical system including an incandescence lamp, which may be adjusted so that its axis coincides with that of the tube. The frame is provided with a transverse handle through which electrical connecting wires may be passed.

—W. F. F.

Hardness; Apparatus for testing —. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,283,362, 29.10.18. Appl., 7.5.15.

THE test piece of material is cut by a revolving tool which is pressed upon it by a constant load. The tool is revolved through a measured peripheral distance, and the torque required is also measured. The hardness is estimated from the measured depth of penetration of the tool.—W. F. F.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Corner. Apparatus for evaporating, concentrating, or distilling liquids or solutions. 1504. Jan. 21.

Cruse. Pulverising materials and collecting and grading pulverised materials. 1346. Jan. 18.

Farrell. 1076. See V.

Fidler. Conversion of round downdraft and up-draught intermittent type kilns to annular continuous kilns. 1524, 1525, 1526. Jan. 21.

Hocking. Fluid condensing, cooling, and heating apparatus. 1353. Jan. 20.

Kestner. Centrifugal pumps for acids etc. 1101. Jan. 15. (Fr., 10.12.17.)

Marks (Smith). Refrigerating and ice-making plants. 1439. Jan. 20.

Marshall. Condenser. 1122. Jan. 15.

Rennie and Rennie. Manufacture of crucibles. 1035. Jan. 15.

Rennison. 1308. See II.

Stockel. Refrigerating machines. 1821. Jan. 24.

COMPLETE SPECIFICATIONS ACCEPTED.

530 (1918). Hinds, Stinchcombe, and Chemical Engineering and Wilton's Patent Furnace Co. Furnaces. (122,232.) Jan. 29.

3784 (1918). Brackett and Co., and Brackett. Screening or filtering apparatus. (122,311.) Jan. 29.

4444 (1918). Hutchins. Drying and like apparatus. (122,077.) Jan. 22.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Abrahams and Bamber. Gas-producers. 901. Jan. 13.
 Bellby and Bellby. Manufacture of reducing gases from carbonaceous materials. 1784. Jan. 24.
 Brighten. Purifying producer gas for heating purposes. 1808. Jan. 25.
 Carpenter, and South Metropolitan Gas Co. Purification of coal etc. gas. 1649. Jan. 22.
 Cossor. 1716. *See* XXIII.
 Davidson and Liversedge. Gas-cleaning apparatus. 1267. Jan. 17.
 Greenwood and Zealley. 890. *See* XXIII.
 Pearson. Treatment of shale etc. 1167. Jan. 16.
 Perry. Apparatus for distilling carbonaceous material. 1425, 1426. Jan. 20.
 Raiger and Co., Raines, and Younger. Preparation for saving coal. 1361. Jan. 20.
 Rennison. Gas-fired oven furnaces. 1308. Jan. 18.
 Russell. Apparatus for drying, revivifying, and decarbonising bone black etc. 1146. Jan. 16.
 Sutton. Destructive distillation of coal etc. 1153. Jan. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

- 14,317 (1917). Drakes, Ltd., and Drake. Retorts and apparatus for use in making gas. (121,975.) Jan. 22.
 16,978 (1917). Ekelund. Pulverised fuel. (122,214.) Jan. 29.
 1274 (1918). Pieters. Coke ovens and the like. (113,782.) Jan. 29.
 4589 (1918). Pickard and Dobson. Combustible gases. (122,079.) Jan. 22.
 17,693 (1918). Smith. Briquets, and method of making the same. (120,585.) Jan. 22.

III.—TAR AND TAR PRODUCTS.

APPLICATION.

- Barrett Co. Process of hydrocarbon sulphonation. 2494. Jan. 31. (U.S., 13,518.)
 South Metropolitan Gas Co., and Stanier. 1338. *See* XX.

IV.—COLOURING MATTERS AND DYES.

COMPLETE SPECIFICATION ACCEPTED.

- 1633 (1918). Ges. f. Chem. Industrie in Basel. Manufacture of chlorinated derivatives of N-dihydro-1.2.2'.1'-anthraquinoneazine. (113,783.) Jan. 29.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

- Farrell. Textile etc. drying cylinders. 1876. Jan. 25.
 Frood. Material prepared from fibres. 1593. Jan. 22.
 Jackson (West Virginia Pulp and Paper Co.). Treatment of waste soda liquors produced in chemical processes of making paper pulp. 1570. Jan. 21.
 Johnson (Philadelphia Textile Machinery Co.). Drying or steaming etc. apparatus wherein materials are subjected to the action of gases or vapours. 1415. Jan. 20.
 McEwen. Treatment of flax etc. 1871. Jan. 25.

- Marks (Dunnelliff). Production of waterproof paper or like cellulosic material. 891. Jan. 13.
 Poulson. Treatment of wool. 2055. Jan. 28.
 Smith. 1923. *See* XIX.
 Suursalmi, and Kangas Pappersbruks Aktiebolaget. Manufacture of paper. 2583. Feb. 1. (Sweden, 4.4.17.)

COMPLETE SPECIFICATIONS ACCEPTED.

- 1181 (1918). Marks (Du Pont de Nemours and Co.). Solvents used in connection with pyroxylin compositions and the pyroxylin compositions containing the same. (122,456.) Feb. 5.
 3139 (1918). Ogawa, Okubo, and Murata. Production of zinc chloride solution of cellulose. (122,527.) Feb. 5.
 9026 (1918). Thames Paper Co., and Privett. Apparatus for drying paper, paper-board, and like material in the course of manufacture. (122,352.) Jan. 29.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATION.

- Stanworth. Dyeing yarns for weaving. 1466. Jan. 20.

COMPLETE SPECIFICATIONS ACCEPTED.

- 18,011 and 18,953 (1917). Jackson. Cloth dyeing, bleaching, and like machines. (121,987.) Jan. 22.
 279 (1918). Kershaw and Cole. Machines for dyeing, mordanting, bleaching, scouring, or similarly treating slubbing, yarn, or other fibrous material. (122,227.) Jan. 29.
 846 (1918). Thornber and Henshilwood. Machines for bleaching, dyeing, finishing, and otherwise treating fabrics. (122,241.) Jan. 29.
 3233 and 3234 (1918). Dudley. Dyeing-machines. (114,621 and 114,421.) Feb. 5.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

- Ashcroft. Treatment of hydrated magnesium chloride for obtaining magnesium metal and by-products. 2503. Jan. 31.
 Evans, Hollings, and South Metropolitan Gas Co. Manufacture of ammonium sulphate. 1427. Jan. 20.
 Howorth (Norsk Hydro-Elektrisk Kvaestof-aktieselskab.). Concentration of sulphuric acid. 1637. Jan. 22.
 Jackson (West Virginia Pulp and Paper Co.). 1570. *See* V.
 Jones and Pearson. Oxidising phosphine. 1442. Jan. 20.
 Joshua, Lowe, and Parsons. Manufacture of permanganates. 1646. Jan. 22.
 Kestner. 1101. *See* I.
 Lessing and Linder. Manufacture of sulphate of ammonia. 1313. Jan. 18.
 Matheson. Recovery of waste acids. 1730. Jan. 23.
 Parrish, Valon, and South Metropolitan Gas Co. Manufacture of neutral sulphate of ammonia. 1744. Jan. 23.
 Rumbold. 2132. *See* X.
 Weight, and South Metropolitan Gas Co. Manufacture of sulphate of ammonia. 1428. Jan. 20.

COMPLETE SPECIFICATIONS ACCEPTED.

16,147 (1917). Place. Liquefaction of air and separating the same into oxygen and nitrogen. (122,212.) Jan. 29.

815 (1918). Hill and Eden. *See* XVI.

1149 (1918). Twynam. Recovery of potash salts in the manufacture of pig iron. (122,048.) Jan. 22.

1390 (1918). Ekeley and Stoddard. Extraction of tungstic acid and acids of certain other heavy acid-forming elements and salts thereof. (122,051.) Jan. 22.

1391 (1918). Ekeley and Stoddard. Process for obtaining pure tungstates. (122,264.) Jan. 29.

2078 (1918). Norske Aktieselskab for Elektrokemisk Industri. Production of aluminium compounds poor in iron. (113,278.) Jan. 29.

2611 (1918). Pope. Manufacture of sulphuryl chloride. (122,516.) Feb. 5.

3057 (1918). Lindblad. Production of nitrides. (122,523.) Feb. 5.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Carborundum Co. Manufacture of refractory articles. 927. Jan. 13. (U.S., 27,918.)

Ionides. 2470. *See* IX.

James. Manufacture of earthenware. 949. Jan. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

3707 (1918). Carborundum Co. (Urtel). Methods of making abrasive articles. (122,533.) Feb. 5.

5715 (1918). Mississippi Glass Co. Light-refracting glass. (118,269.) Jan. 29.

19,370 (1918). Sankey and Foster. Manufacture of silica bricks, tiles, and other articles. (122,388.) Jan. 29.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Bollot and Daudignac. Manufacturing cement. 1113. Jan. 15.

Cafferata and Johnson. Manufacture of slabs, plates, etc. of plaster etc. 1105. Jan. 15.

Hobson. Materials for making roads, footpaths, etc. 1700. Jan. 23.

Ionides. Heat treatment of bricks, pottery, etc. 2470. Jan. 31.

COMPLETE SPECIFICATION ACCEPTED.

4752 (1918). Afford. Artificial stone. (122,546.) Feb. 5.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Ashcroft. 2503. *See* VII.

Bolton. Electroplating. 1271. Jan. 17.

Coles. Recovery of iron from scrap tinned steel. 1861. Jan. 25.

Coles. Electrodeposition of iron alloys. 1862. Jan. 25.

District Chemical Co., and Hoblyn. Mixtures for carburising steel during case-hardening. 1456. Jan. 20.

Gingell and Muntz. Casting metals. 1356, 1483. Jan. 20 and 21.

Goldthorpe. Ore-roasting furnaces. 1461. Jan. 20.

Jones. Furnaces for heating metal etc. without oxidation. 1410. Jan. 20.

Rumbold. Recovery of lead and tin as metals from the solution of chloride of lead and chloride or sulphate of tin etc. 2132. Jan. 28.

Smith. Art of desulphurising ores, and roasting-furnaces therefor. 1060. Jan. 15.

Sulman. Metallurgical furnaces. 2493. Jan. 31.

Thomas. Manufacture of tin and terne plates etc. 1490. Jan. 21.

Weyman. Apparatus for cooling blast-furnace gases. 1150, 1261. Jan. 16 and 17.

COMPLETE SPECIFICATIONS ACCEPTED.

17,494 (1917). Sanders. Obtaining by-products from the waste flux of galvanising or equivalent processes. (121,984.) Jan. 22.

526 (1918). Pettevil. Welding different metals to form a composite ingot. (122,231.) Jan. 29.

577 (1918). Rogers, Lancaster, Walker, and Jackson. Treatment of tinned scrap. (122,025.) Jan. 22.

920 (1918). Fletcher. Puddling of iron. (122,244.) Jan. 29.

1149 (1918). Twynam. *See* VII.

4545 (1918). Gayley. Methods and apparatus for sintering ores. (115,023.) Jan. 22.

6193 (1918). Marks (United States Nickel Co.). Separation of nickel from nickel-copper mattes. (122,335.) Jan. 29.

7025 (1918). Crocker and Crocker. Increasing the production of zinc dust from spelter retorts. (122,566.) Feb. 5.

10,519 (1918). Eaton. Etching steel or other plates. (122,358.) Jan. 29.

12,583 (1918). Pltitevil. Welding different metals to form a composite ingot. (122,365.) Jan. 29.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Bolton. 1271. *See* X.

Coles. 1862. *See* X.

Debauge. Electrolytic processes. 2369. Jan. 30. (Fr., 30.1.18.)

Debauge. Electrolytic apparatus. 2370. Jan. 30. (Fr., 30.1.18.)

Matheson. Electrolytic cells. 1731. Jan. 23.

Matheson and Kaelin. Electrolytic cells. 1732. Jan. 23.

Naylor and Tyler. Electric batteries. 1071. Jan. 15.

Soc. Electro-Métallurgique Française. Electric furnaces. 1650. Jan. 22. (Fr., 11.2.18.)

Travis, and Watson and Co. Resistors for electric furnaces. 1123. Jan. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

729 (1918). Kayser and Robinson. Electrode holders for electric furnaces. (122,034.) Jan. 22.

839 (1918). Connolly and Ellison. Electric batteries. (122,240.) Jan. 29.

933 (1918). Bayeux and Richard. Ozonising apparatus. (113,606.) Jan. 29.

1896 (1918). White (Industrial Electric Furnace Co.). Electric furnaces. (122,282.) Jan. 29.

15,587 (1918). Stewart. Electrodes or plates for electric accumulators of the alkaline type. (122,380.) Jan. 29.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

De Raedt. Apparatus for extracting oils, fats, sugar, etc. 1849. Jan. 24.

Spensley. Manufacture of dry soaps. 1890. Jan. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

18,335 (1917). Bevan. Treatment of fatty acids to render them suitable for use as oil-mediums for paint and other purposes. (121,992.) Jan. 22.

44 (1918). Blogg. Oxidation and polymerisation of vegetable oils. (122,224.) Jan. 29.

505 (1918). Wilkins and Co., and Allsebrook. *See* XIII.

12,254 (1918). Gaudart. Extraction of coconut butter. (117,819.) Jan. 29.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Goldthorpe. Paints, and method of making same. 1462. Jan. 20.

Govan. Ink manufacture. 1462. Jan. 20.

Griffith. 1676. *See* XIV.

COMPLETE SPECIFICATIONS ACCEPTED.

18,335 (1917). Bevan. *See* XII.

505 (1918). Wilkins and Co., and Allsebrook. Manufacture of linseed oil substitutes suitable as mediums for the manufacture of paints, vehicles, linoleum, etc. (122,015.) Jan. 22.

604 (1918). Wade (Redmanol Chemical Products Co.). Phenolic condensation product varnishes. (122,027.) Jan. 22.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

Griffith. Vulcanising pigments etc. 1676. Jan. 23.

Van Hasselt. Process for vulcanising rubber with aid of an accelerator. 1008. Jan. 14. (Holland, 8.5.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

980 (1918). Dunlop Rubber Co., and Twiss. Method and apparatus for reclaiming rubber. (122,249.) Jan. 29.

3783 (1918). Broomfield. Manufacture of a rubber compound. (112,310.) Jan. 29.

XV.—LEATHER; BONE; HORN; GLUE.

COMPLETE SPECIFICATION ACCEPTED.

1990 (1918). Haley and Co., and Bolton. Machines for treating hides, skins, and leather. (122,505.) Feb. 5.

4837 (1918). McCay. Manufacture of leather. (122,084.) Jan. 22.

XVI.—SOILS; FERTILISERS.

COMPLETE SPECIFICATION ACCEPTED.

815 (1918). Hill and Eden. Apparatus for use in making superphosphate. (122,639.) Jan. 22.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

De Raedt. 1849. *See* XII.

Durham. Handling and storing of sugar cane in sugar factories. 1894. Jan. 25.

Russell. 1146. *See* II.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATION.

Robinson. Preservation of yeast. 1845. Jan. 24.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Hartley and Hartley. Purification of sewage. 1604. Jan. 22.

Marks (Mortensen). Milk etc. separators. 1909. Jan. 25.

Pape. Preserving organic materials. 1837. Jan. 24.

Powrie. Food product, and process of making same. 1141. Jan. 16.

Smith. Apparatus for separating sewage, paper pulp, etc. from liquids. 1923. Jan. 25.

Wauguler et Cie. Desiccation of potatoes etc. 1083. Jan. 15. (Fr., 15.1.18.)

Weddle. Utilisation of animal and vegetable matters. 1885. Jan. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

380 (1918). Stevens and Dunlap. Preparing and preserving food preparations consisting of cereals and milk. (115,618.) Jan. 22.

7094 (1918). De Grousseau and Viconge. Treatment of cocoa and the waste products of chocolate manufacture. (116,694.) Jan. 29.

15,699 (1918). Manuel. Preserving fish, fowl, and flesh. (122,154.) Jan. 22.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Atack and Haworth. Manufacture of aromatic alkylamino compounds. 1600. Jan. 22.

Barrett Co. 2494. *See* III.

Jackson (Citro Chemical Co.). Manufacture of organic acids. 2376. Jan. 30.

Matheson. Manufacture of acetone. 1729. Jan. 23.

South Metropolitan Gas Co., and Stanier. Manufacture of colourless organic compounds. 1338. Jan. 18.

COMPLETE SPECIFICATION ACCEPTED.

1796 (1918). Haworth and Irvine. Preparation of dimethyl sulphate. (122,498.) Feb. 5.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

COMPLETE SPECIFICATION ACCEPTED.

2911 (1918). Hess-Ives Corporation. Colour photography. (113,618.) Feb. 5.

XXII.—EXPLOSIVES; MATCHES.

COMPLETE SPECIFICATION ACCEPTED.

1181 (1918). Marks (Du Pont de Nemours and Co.). *See* V.

XXIII.—ANALYSIS.

APPLICATIONS.

Cossor. Apparatus for ascertaining composition of furnace gases. 1716. Jan. 23.

Greenwood and Zealley. Apparatus for detecting and/or recording small quantities of a combustible gas in gaseous mixtures etc. 890. Jan. 13.

I.—GENERAL; PLANT; MACHINERY.

Heat insulation and lagging materials. J. S. F. Gard. Nat. Assoc. Ind. Chem., Jan. 11, 1919. Chem. Trade J., 1919, 64, 47.

THE most efficient lagging for boilers, steam-pipes and engines is "magnesia covering" composed of hydrated magnesium carbonate 85%, and asbestos fibre 15%; it has a density of 12-15 lb. per cub. ft. and will retain 85-87% of the heat which would escape from an uncovered pipe. Silicate cotton or slag wool is an efficient lagging material, but when subjected to vibration it is reduced to half its original volume. None of the various asbestos materials is as efficient as magnesia. Various plastic compounds containing kieselguhr, felt, clay, lime, etc., are also used for lagging purposes. Furnace settings are chiefly lagged with very light, porous silica bricks having a honeycomb structure, and a density of 30-35 lb. per cub. ft. (compared with 112-125 lb. for common bricks and 137-159 lb. for firebricks). The following figures show the heat lost from a pipe lagged with various materials each $\frac{1}{2}$ in. thick, with steam at 400° F. (204.5° C.), and an outside temperature of 68° F. (20° C.):—

Magnesia, 118 B.Th.U.; blue asbestos, 121; mica (best only), 123; white asbestos, 126; plastics, etc. (best), 133; plastics, etc. (inferior), 143; bare pipe, 1070 B.Th.U. per sq. ft. per hour. The graph representing the ratio of heat-loss to thickness of covering of magnesia is almost hyperbolic, so that complete insulation is impossible. For a temperature of 400° F. (204.5° C.) covering more than $\frac{1}{2}$ in. thick is of little additional value. For temperatures above 400° F. a thickness of 2 in. is necessary. The thickness of covering which will give the maximum retention of heat at minimum cost is most readily ascertained by such a graph. Where an acid-resisting lagging is required, magnesia covered with an acid-resisting coating is best.—A. B. S.

Ovens and kilns. Bigot. See VIII.

PATENTS.

Gases; Method of and apparatus for electrical treatment of — L. Bradley, East Orange, N.J., U.S.A. Eng. Pat. 120,573, 21.6.17. (Appl. 17,277/18.) Int. Conv., 21.6.16.

The apparatus is similar to that described in Eng. Pats. 107,389, 119,236, 119,237, 119,238 (this J., 1919, 61 A), the localised frictional resistance, for maintaining uniformity of flow in the gases in the treater ducts, being obtained by providing gas inlet or outlet openings not associated individually with the respective pipes or flues, as in the prior patent, but located adjacent to the treater ducts. The total superficial area of the openings is smaller than the total cross-section of the treater ducts, so that increased velocity through the latter will result in greater friction in the corresponding part of the constricting means. The constricting passages may be formed in plates located in the bottom or top headers, and may be provided with means for regulating the size of the openings, or the passages may be made in the form of "venturi" pipes.

—B. N.

Heat; Means or apparatus for transmitting and utilising [waste] — E. L. Pease, Darlington. Eng. Pat. 121,752, 22.6.17. (Appl. 9016/17.)

A strong solution of calcium chloride or creosote or other non-acid liquid of high boiling point is sprayed into the top of a tower and absorbs heat from the waste gases of a furnace or an internal combustion engine, which pass upwards through the spray. The cooled washed gases are drawn

off at the top. The hot liquid is discharged at the bottom, and passes through an apparatus in which floating impurities are skimmed off, to a steam generator or other heat-utilising device of the type described in Eng. Pats. 4154 of 1915, 103,492, and 104,721. The liquid may then be returned to the top of the tower. The same apparatus may also be used as a means for washing soluble constituents from the gas. The initial temperature of the hot gases may be reduced by passing them through a preliminary tower through which water is sprayed. In a modification, the heat-absorbing apparatus may consist of a tank containing the absorbing liquid, and provided with a series of parallel rotating discs mounted on a horizontal shaft and dipping into the liquid. Heat is taken from the gas by the upper portions of the discs, and transferred to the liquid by the rotation of the discs. The heated liquid may be conveyed to, and its heat utilised at a distance from the tower or other heat-absorbing apparatus.

—W. F. F.

Furnaces or muffles; Gas-heated — J. M. Wallwin, Warwick. Eng. Pat. 121,917, 27.6.18. (Appl. 10,589/18.) Addition to 112,747, 4.9.17.

A GAS-HEATED furnace or muffle of the type described in the principal patent (this J., 1918, 141 A) is provided with a removable hollow metal cover through which the gas or air is passed to preheat it before passing to the burner. In a modification, the furnace may be divided centrally by a horizontal hollow member with an orifice for the combustion products, and this member is used in conjunction with the hollow cover for preheating the gas and air separately. The dividing member and also the cover may be grooved or corrugated.—W. F. F.

Furnaces and firebricks therefor; Method of constructing — J. W. Kunzler, Assignor to W. W. Lapham, Pittsburgh, Pa. U.S. Pat. 1,285,244, 19.11.18. Appl., 15.9.14. Renewed 14.9.18.

THE bricks used for lining a furnace are saturated with water, then "laid" in the usual manner; the exposed surface of the brickwork is coated with a fireclay composition, containing an alkali, and the furnace is then fired to "set" the coating.

—A. R. S.

Desiccation process. F. W. Lietzow and O. F. Fleischer, Chicago, Ill., Assignors to Merrell-Soule Co., Syracuse, N.Y. U.S. Pat. 1,282,093, 22.10.18. Appl., 29.5.12.

LIQUID to be desiccated is atomised and projected into a desiccating chamber near the top, and falls through heated air which is introduced laterally at the middle of the chamber. The air and vapour rise through the chamber and are discharged at a point above the inlet for the liquid. The desiccated substance is collected as a dry powder in the bottom of the chamber.—W. F. F.

Steam-boiler economisers; Method of operating — D. S. Jacobus, Jersey City, N.J., and H. C. Heaton, Chicago, Ill., Assignors to The Babcock and Wilcox Co., Bayonne, N.J. U.S. Pat. 1,285,201, 19.11.18. Appl., 8.12.14.

THE cooling water from the condenser is brought into contact with the air supply for a boiler furnace, and the moist air passed through the furnace. The waste gases are passed over an economiser in the flue, through which feed water is passed to the boiler, and part of the moisture is condensed on the tubes of the economiser.—W. F. F.

Filter film or bed and process of making the same. L. S. Knight, New York. U.S. Pat. 1,285,233, 19.11.18. Appl., 27.6.17. Renewed 7.5.18.

Flocculent asbestos fibre is distributed over a suitable surface and a cylinder having a removable woven fabric covering is rolled over it. The fibre adheres to the cylinder; it is coated with a purifying agent, and the cylinder is then rolled over another mass of fibre. The tubular fibrous form is then removed and dried.—W. F. F.

Vacuum-cooler with interior absorption. P. Schou, Copenhagen. U.S. Pat. 1,285,415, 19.11.18. Appl., 16.3.18.

A CENTRAL evaporation chamber is surrounded by an absorption chamber containing a series of superposed annular trays for the absorbing medium. The absorption chamber communicates with the evaporation chamber through openings in the walls above the levels of the liquid in the trays, and the whole is surrounded by a cooling jacket.—W. F. F.

Weighing and delivering apparatus for charging cupolas or like uses; Proportional —. J. W. Hartley, Stone, Staffs., and W. and T. Avery, Ltd., Birmingham. Eng. Pat. 121,993, 12.12.17. (Appl. 18,404/17.)

Air-filter. F. W. R. Williams, London. U.S. Pat. 1,282,345, 22.10.18. Appl., 14.3.17.

See Eng. Pat. 100,876 of 1916; this J., 1916, 915.

Drying materials in sacks or similar vessels; Apparatus for —. H. P. Dinesen, Herlöv, Denmark. U.S. Pat. 1,282,771, 29.10.18. Appl., 30.10.17.

See Eng. Pat. 109,965 of 1917; this J., 1917, 1171.

Expressing liquids. Eng. Pat. 121,759. See IIA.

Fractional distillation. Eng. Pat. 121,748. See III.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Petroleum oil and coal. J. Marcusson. Chem.-Zelt., 1918, 42, 437—439.

ASPHALTENES (i.e. the bituminous constituents of natural and artificial asphalts insoluble in petroleum spirit) closely resemble coal in their behaviour with reagents. They contain about the same proportions of carbon but somewhat more hydrogen and less nitrogen than coal, whilst both contain oxygen and sulphur. They swell up when heated, but, unlike coal, are soluble in benzene, carbon tetrachloride, and carbon bisulphide. In a few natural asphalts such as grahamite, compounds termed carbenes, which are akin to asphaltenes, are found. These resemble coal in appearance and are insoluble in cold carbon tetrachloride. Products representing a still further stage of decomposition occur in albertite and Benthelm asphalt. These are deep black and lustrous, and, like coal, are insoluble in organic solvents. The name "carboids" is suggested for these compounds. All three classes of compounds form distinctive addition compounds with sulphuric acid, whilst coal forms similar compounds, which are also insoluble in water. The products of the reaction (100 to 110%) are greyish-black and lustrous, and contain from 2.5 to 5.1% of sulphur, the coal derivative being intermediate in this respect. When boiled with water or dilute hydrochloric acid they are decomposed, with the liberation of sulphuric acid,

but are stable towards alcoholic alkali. The asphaltene and carbene sulphuric acid compounds are soluble in pyridine, and the solution can be diluted with water. On adding mineral acids or salts of calcium, iron, or silver to the dilute solution precipitates of the acids or the corresponding salts are obtained. The reaction products of carboids are insoluble in pyridine. By treating asphaltenes with strong sulphuric acid and heating the mixture for 2 hours in a steam-bath, products containing a somewhat higher proportion of sulphur and insoluble in pyridine are obtained. By using fuming sulphuric acid higher yields (119 to 156%) of products containing 6.8 to 10.1% of sulphur are obtained. When the compounds from carboids or coal are heated with aqueous potassium hydroxide solution a considerable amount of sulphuric acid is split off, and the amount of sulphur in the residual products is similar to that in the original samples, whereas the compounds from asphaltenes and carbenes are not affected by aqueous potassium hydroxide. On adding concentrated sulphuric acid to suspensions of finely-powdered asphaltic substances or coal in methylal, formolites are produced. Chlorosulphonic acid acts upon them energetically. On treating asphaltic substances or coal with nitric acid of sp. gr. 1.52, from 121 to 130% of dark brown dinitro compounds are produced. The compounds from asphaltic substances are completely soluble in acetone whilst those from coal are almost completely soluble if treated with the solvent while still moist. The soluble products contain from 6.2 to 4.8% of nitrogen. By adding an ethereal solution of ferric chloride or mercuric chloride to the acetone solution double compounds are precipitated. The compounds with sulphuric acid formed by coal have not the characters of sulphonic acids but of sulphuric acid oxonium compounds, and a similar atomic grouping of the oxygen atoms must be assigned to the asphaltic compounds. The observed resemblances in the behaviour of coal and asphaltic substances must be attributed not only to the carboid content of the coal, but also to the fact that the products of the decomposition of cellulose, although not identical with carboids, yet have a similar polycyclic structure, are saturated compounds, and contain oxygen linked in an analogous manner. The close chemical relationship of asphaltenes from petroleum and of coal may thus be explained without the necessity of assuming a genetic relationship between coal and petroleum.—C. A. M.

Humic acids. J. Marcusson. Z. angew. Chem., 1918, 31, 237—238.

HUMIC acids prepared from Silesian lignite (yield 65%) contained 2.1% of nitrogen, 0.37% of sulphur, and 7.6% of mineral matter, and formed dark coloured alkali salts resembling those of the "oxidised" acids of blown oils. On treatment with strong sulphuric acid and addition of water they yielded about 70% of dark brown products containing 1.5% of sulphur, and with fuming sulphuric acid 43% containing 2.6% of sulphur. By treatment with nitric acid (sp. gr. 1.42) and addition of water, 53% of a dark brown substance separated. This was readily soluble in alkali solutions and the liquid frothed when shaken, but was too dark to be suitable for a soap substitute. It was a cyclic nitro compound containing 2.9% of nitrogen. By the action of nitric acid of sp. gr. 1.52 a dinitrohumic acid was obtained. The compounds of humic acids with sulphuric and nitric acids resemble in many respects the analogous compounds given by coal and lignite (see preceding abstract), but owing to their carboxyl content the oxonium compounds obtained from humic acids are, unlike the coal compounds, completely soluble in alkali solutions. The nitration product of humic acids resembles

that from coal in being insoluble in ether, benzene, chloroform, and petroleum spirit, but is readily soluble in acetone, dichlorhydrin, pyridine, and alkalis. It combines with alkalis to form soluble salts of isonitro compounds which are decomposed by acids with the liberation of nitrous oxide. Nitrohumic acids, like nitro-coal, can form addition compounds with sulphuric acid and bromine, and form double compounds with ferric chloride and mercuric chloride. Since coal contains as its main constituents polycyclic oxygen compounds the oxygen of which is linked in bridge formation, it may be assumed that humic acids contain similar nuclei. This conclusion is supported by the fact that acids closely resembling natural humic acids in character may be prepared by the hydrolysis of carbohydrates, whilst the fact that furan derivatives are obtained by the dry distillation of humic acids indicates that they contain a furan nucleus. Natural humic acids are mixtures of nitrogenous and non-nitrogenous acids. The former contain a pyridine ring, which is perhaps also combined with a furan nucleus, and also an amino or imino group in open chain formation. It is probable that humic acids are the source of both the oxygenated and nitrogenous constituents of coal.—C. A. M.

Steaming horizontal [gas] retorts. R. J. Rew. Gas J., 1919, 145, 69–70.

THE author, as the result of extended trials, recommends very slight steaming, if any, during the first eight hours of the carbonising period, the retort being fully steamed during a subsequent 40-hour period. Superheated steam must be employed, and its temperature should be as high as possible. Maximum time contact between steam and coke is desirable, and to this end, the steam is admitted at as low a pressure as possible. The make of water-gas per retort ($21' \times 15' \times 10'$) varies from 3000 to 13,000 cub. ft. The percentage of carbon dioxide in the purified water-gas averages about 5%.

—J. S. G. T.

Gasoline; Recovery of — from natural gas by compression and refrigeration. W. P. Dykema. U.S. Bureau of Mines, Bull. 151, 1918, 123 pages.

THE natural gas obtained from oil wells invariably carries greater or smaller amounts of hydrocarbons which are liquid at ordinary atmospheric temperature and pressure, and the recovery of these hydrocarbons is now extensively carried out by compressing and cooling the natural gas. As a general rule, if the crude oil has sp. gr. below 0.920 the casing-head gas can be profitably treated for gasoline by compression. The "dry" gas remaining after treatment is used to drive the gas engines of the compression plant and also for gas and steam engines in pumping and drilling wells. At present plants are in operation treating 6 to 9 million cub. ft. daily of gas yielding as low as 1 gall. of liquid products per 1000 cub. ft., using pressures of 250 to 300 lb. per sq. in. in two stages of compression, with elaborate systems of cooling the gas before compression and after each stage of compression. In some plants the gas is further cooled by expanding the dry treated gas through the cylinders of an expansion engine and using the cold expanded gas to cool the high-pressure gas from the water-cooled coils. Temperatures as low as 0°F. (-18°C.) are often obtained, causing the separation of nearly all condensable fractions commercially valuable for making gasoline. Ammonia is also used as an auxiliary cooling agent. Gas from wells which are held under high vacuum is composed largely of the heavier vapours, and in these cases single-stage plants working at a pressure of about 100 lb. per sq. in., and using cooling coils submerged in water, give satisfactory

recoveries. In plants using two-stage compression, the average pressure developed by the first stage is between 40 and 50 lb. per sq. in., the temperature rising to 200° – 250°F. (93° – 121°C.). The proportion of condensed liquid collected in the low-stage accumulator tanks averages 15–30% of the total yield. This material, which has sp. gr. about 0.737, is itself an ideal motor fuel, but is usually mixed with the lighter fractions. The condensed liquid obtained at the maximum pressure generally represents the principal bulk of the total recovery, seldom being less than 30% of the total product. The average sp. gr. of the high-stage condensed liquid is approximately 0.651 in eastern American fields, 0.673 in Oklahoma, and 0.693 in California. This product is "wild," i.e. contains constituents normally gaseous at atmospheric temperature and pressure, and is usually at once discharged into tanks containing the heavier fractions. The lightest fraction of all is that obtained from the expansion exhaust, and this may have as low a sp. gr. as 0.60. The condensed liquid is preferably removed from contact with the gas as soon as possible, and this is accomplished by the use of small automatic traps which drain the liquid from the accumulator tanks to storage tanks at lower pressure as soon as collected. Most casing-head gasoline is mixed or blended with about an equal volume of naphtha, consisting of those fractions distilling from crude oil after the cuts marketed as "straight still-run" gasoline have been distilled off, and having an end point of about 400°F. (204°C.). Such blending is often necessary to produce suitable motor spirit, and also to reduce the vapour tension to the degree required for safe transport. Loss of the lighter fractions is also prevented by blending the casing-head gasoline with naphtha at as early a stage as possible. The practice at every stage of the process of the recovery of gasoline from natural gas varies considerably at different works. The author has visited a large number of recovery plants in all parts of the United States, and describes the various methods of procedure adopted. Data relating to the engines and compressors used at 80 compressor plants are given, together with details of capacity, output, etc.—T. St.

Ammonium sulphate. Wolff. See VII.

Spent oxide. Colman and Yeoman. See VII.

Flue-gas analysis. Dubrisay and others. See VII.

PATENTS.

Expressing liquid from materials [e.g. peat]. J. W. Hinchley, London, C. S. D. Harper, and The Power-Gas Corporation, Ltd., Stockton-on-Tees. Eng. Pat. 121,759, 30.10.17. (Appl. 15,824/17.)

AN extrusion press which is particularly suitable for expressing water from peat comprises two narrow vertical rectangular compressing chambers, separated and bounded by hollow walls in which narrow cells extending the full height of the walls are formed. The surfaces adjacent to the compressing chambers are perforated to allow expressed liquid to pass into the cells, and the liquid is discharged through pipes at the bottom of the cells leading to a common discharge pipe. The compressing pistons are moved horizontally by a hydraulic ram. Hot gas is introduced into the compression chambers by short valved pipes opening into the top and connected to a common main. The extrusion orifice is rectangular in cross-section, with parallel side walls and curved converging top and bottom walls. The outlet is closed by a sliding shutter, attached at one end to a plunger con-

connected to a constant pressure accumulator, and at the other end to a plunger connected to the cylinder of the ram which operates the compressing pistons. At the beginning of the compression stroke the pressure due to the constant pressure accumulator will preponderate and keep the shutter closed, but when the resistance increases the pressure on the opposing plunger will preponderate and open the shutter. The extrusion orifice is lined with porous ceramic material, backed by perforated plates to conduct the filtered liquid away. A modification is described in which the building up and dismantling are facilitated.

—W. F. F.

Motor fuel; Apparatus for making — W. A. Hall, New York. U.S. Pat. 1,285,136, 19.11.18. Appl., 9.2.16.

OIL of high boiling-point is forced by a pump, at a pressure of several atmospheres, through a pre-heater to a retort comprising a series of vertical loops, in which it is cracked. The gases and vapours pass through a reducing valve to a condenser at a substantially lower pressure. The gases and vapours leaving the condenser are compressed, and passed through a second condenser.

—W. F. F.

Hydrocarbons; Art of cracking — E. W. Isom, Assignor to Sinclair Refining Co., Chicago, Ill. U.S. Pat. 1,285,200, 19.11.18. Appl., 10.9.17.

OIL is circulated under pressure from a tank through vertical heating pipes extending completely through the heating flues of a furnace, and then back to the tank. Hand holes are provided in the flue at each end of the heating pipes.—W. F. F.

[Fuel] briquettes and method of making the same. C. H. Smith, Short Hills, N.J., U.S.A. Eng. Pat. 111,285, 29.8.17. (Appl. 12,433/17.) Int. Conv., 15.11.16.

SEE U.S. Pat. 1,276,429 of 1918; this J., 1918, 646 A.

Coke-ovens; Method of heating — R. Geipert, Assignor to Dessauer Vertikal Ofen Ges., Berlin. U.S. Pat. 1,281,775, 15.10.18. Appl., 24.2.15.

SEE Fr. Pat. 471,644 of 1914; this J., 1915, 414.

[Mineral] oils; Treating — A. Philip, Portsmouth. U.S. Pat. 1,286,091, 26.11.18. Appl., 5.6.14.

SEE Eng. Pat. 14,778 of 1913; this J., 1914, 824.

Utilising [waste] heat. Eng. Pat. 121,752. See I.

Gas-heated furnaces. Eng. Pat. 121,917. See I.

Fractional distillation. Eng. Pat. 121,748. See III.

Extracting ammonia from gases. Eng. Pat. 121,754. See VII.

Diolfines. U.S. Pat. 1,282,906. See XX.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Gas-mantle lamps; Influence of quality of gas and other factors on the efficiency of — R. S. McBride, W. A. Dunkley, E. C. Crittenden, and A. H. Taylor. U.S. Bureau of Standards, Tech. Paper 110, 1918, 49 pages.

THE paper is a report of a part of a general investigation to determine the relative usefulness of gases of different heating values for mantle lighting, cooking, water heating, etc. (cf. this J., 1918, 681 A).

Experiments were carried out with various types of upright and inverted incandescence mantle burners and the gases employed in the investigation comprised carburetted water-gas of about 665 B.Th.U. and 565 B.Th.U. per cub. ft., coal-gas of about 565 B.Th.U. per cub. ft., some specially enriched gases of higher calorific value, and natural gas of calorific value 1120 B.Th.U. per cub. ft. In general the candle power of the upright incandescence burners was determined in a horizontal direction only, and that of the inverted burners in a direction making an angle of 20° with the horizontal. The mean spherical candle power in each case was, when necessary, calculated by means of a reduction factor, experiments having shown that the values so obtained agreed with those determined by means of the integrating sphere or otherwise. In the first series of experiments the various burners were adjusted until the maximum candle power at 2", 3", and 5" water column respectively was obtained, and then the candle power ascertained at various supply pressures, varying from 1" to 8" water column. The main results are as follow:—(1) The lower the pressure at which the lamp is adjusted to maximum candle power, the greater is the gas consumption at any given pressure. (2) The candle power increases with increasing pressure up to and beyond the pressure for the maximum efficiency until a maximum candle power is obtained, after which the candle power decreases with further increase of pressure. (3) The maximum efficiency is almost invariably found at pressures between 2" and 4" water column. In the investigation of the effect of quality of gas upon the performance of the various lamps, the pressure at the burner was maintained constant, the gas and air supply being adjusted so that the best result, separately, as regards candle power and efficiency respectively was obtained. The chief conclusions drawn are:—(1) The inverted burners show no difference in efficiency with lean water-gas with either adjustment. (2) Upright burners have a higher efficiency with lean water-gas than with town gas both at maximum efficiency adjustment and at maximum candle power adjustment. (3) The upright burners similarly show a distinct advantage in the use of the benzol-enriched gas as compared with ordinary town gas. (4) With all types of burners there is a small advantage gained by the use of water-gas rather than coal-gas of the same heating value, except in some cases at very low pressures. Experiments involving alterations of gas quality lead to the conclusion that if a lamp is adjusted for maximum candle power, an increase in the heat value of the gas supplied produces a decrease of efficiency and *vice versa*. It is concluded that the usefulness of a uniform quality of coal-gas of 550 to 575 B.Th.U. per cub. ft. increases or decreases with a corresponding change in the calorific value of the gas.—J. S. G. T.

PATENTS.

Oil-bearing shale, bitumens, hydrocarbons, and other elements of a volatile nature; Apparatus for the treatment [distillation] of — J. H. Galloupe, Denver, Colo. U.S. Pat. 1,283,723, 5.11.18. Appl., 19.11.17.

A RETORT in the form of a longitudinal bed of semi-circular cross-section is fitted with a hood from which partitions extend nearly to the bed. A horizontal shaft passes through the retort and operates rabblies which cause the material to pass from the feeding to the discharging end of the apparatus. Products of distillation are withdrawn through a number of pipes leading from the upper parts of the cells formed by the partitions.—C. A. K.

Coal and other carbonaceous matter; Carbonisation and distillation of — by electricity. C. W. Simpson, Leeds, and L. Moorhouse, Barnsley. Eng. Pat. 121,854, 19.2.18. (Appl. 2878/18.)

Coal and like carbonaceous material is carbonised and distilled to produce coke, fuel oil, and gas, by an electric current transmitted through the charge by electrodes partly embedded in the lining of the retort. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 20,115 of 1910 and 13,951 of 1914; this J., 1911, 1391; 1916, 547.)—W. F. F.

Vacuum [X-ray] tubes. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 121,878, 20.3.18. (Appl. 4383/18.)

The anode for an electron discharge device, particularly for "X-ray targets," comprises a plate of metal, such as "invar," having a substantially zero coefficient of thermal expansion, with means for cooling the plate, which is also provided with a facing of tungsten united to it by means of a film of copper.—B. N.

III.—TAR AND TAR PRODUCTS.

PATENTS.

Fractional distillation of liquids [crude benzol, etc.] and apparatus therefor. G. E. and S. H. Walker, Radcliffe, Lancs. Eng. Pat. 121,748, 9.12.16. (Appl. 17,740/16.)

Crude liquor containing lighter hydrocarbon oils flows by gravity from a tank through a succession of stills, each at a lower level and a higher temperature than the preceding one. The liquor enters each still at the base and passes upwards through a set of vertical tubes round which steam is circulated, to another chamber which is surmounted by a fractionating column. The distilled vapour passes from the first still to a heating coil in the supply tank and thence to a condenser. The first still may be heated by hot vapour from the second still instead of by steam, and the second still by vapour from the third still. Crude benzol may be treated thus for the separation of benzol, toluol, and solvent naphtha.—W. F. F.

Tar and the like; Distillation of —. J. W. Westwood, Birmingham. Eng. Pat. 121,804, 2.1.18. (Appl. 47/18.)

Tar is heated in a tank by high-pressure hot water tubes to about 140° C., to expel water vapour, and then passed through a horizontal still containing horizontal high-pressure hot water tubes, by which its temperature is raised to about 230° C. The still is mounted over a hot gas flue leading from a furnace which contains a set of heating tubes in series with the tubes in the still. The tar passes from the still to a vertical separating tank heated internally by three superposed coils of high-pressure hot water tubes connected in series. The outlet of the pipe conveying the tar is provided with a spraying or film-forming device which is surrounded by the middle hot water coil. The remaining water vapour and light oils are thus removed by contact with the hot coil, and pass out of the separating tank to a condenser. The tar residue is discharged at the bottom of the tank.—W. F. F.

IV.—COLOURING MATTERS AND DYES.

Yellow dye. Mees and Clarke. See XXI.

[Sulphur dyes from] trinitrotoluene residues. Copisarow. See XXII.

PATENT.

Colouring matters; Manufacture of new compounds to be employed as —, or in the production of colouring matters. M. L. Angel, Oxford, Executrix of A. Angel. Eng. Pat. 121,347, 13.12.17. (Appl. 18,484/17.)

The name "parazenes" is suggested for a new type of compounds in which two benzenoid nuclei are linked together by two nitrogen atoms through four para carbon atoms of the nuclei. They may be prepared by heating a *p*-halogenaminobenzene (or 1.4-aminohalogenaphthalene) or a derivative of either in which indifferent groups are substituted in the nuclei (or a mixture of such compounds) with a condensing agent such as zinc chloride, ferric chloride, aluminum chloride, phosphorus pentoxide, etc. The resulting product is a dihydro-parazene, and on oxidation yields a parazene. For example, *p*-chloroaniline or *p*-bromoaniline is heated with constant stirring in an open vessel with three times its weight of zinc chloride for 1 to 1½ hours at about 200° C. After cooling, the mass may be dissolved in acetic acid and the solution used as a dye for silk or wool. The parazene from *p*-chloroaniline may be isolated as a dark blue powder by filtering the solution after the whole of the zinc chloride has dissolved. (See also J. Chem. Soc., 1919, i, 98.)—C. A. M.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

PATENTS.

Flocks, rags or the like; Machines for washing —. E. V. Chambers and T. C. Hammond, Lightcliffe, Yorks. Eng. Pat. 121,689, 8.4.18. (Appl. 5946/18.)

In a washing machine comprising an open trough with perforated false bottom and a circulating paddle wheel, baffles are arranged near the bottom of the trough, obstructing the circulation of the water at the lower depth sufficiently to cause the sand and heavy impurities to be intercepted and settle out, so that they fall through the perforations of the false bottom. The baffle-plates may be arranged parallel with each other, transversely of the vessel, or at opposing angles to each other, or else parallel with each other at an angle with the axis of the trough.—J. F. B.

Paper pulp; Process for utilising dead leaves as stock for making —. K. Bramson, Paris. Eng. Pat. 121,847, 7.2.18. (Appl. 2258/18.)

Dead leaves of deciduous trees are treated for the separation of the blade from the ribs and stalks. The portion derived from the blade is unsuitable for paper manufacture, but the rib and stalk material, after disintegration, is treated with water or with a solution of caustic soda at 120°–143° C. An apparatus suitable for grinding and separating the ribs and stems consists of a hollow spherical casing in which is rotated a perforated spherical body, provided with stirring arms and containing iron or stone balls. The material of the blades of the leaves is ground so that the particles fall through into the casing and are discharged, leaving

the disintegrated rib material ready for charging the pulp digesters. (Reference is directed under Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 1853 and 2168 of 1871, 4529 of 1882, and 18,572 of 1892; this J., 1893, 261.)

—J. F. B.

Nitro-acetic esters of cellulose; Process of making — J. Koetschet, Lyon, and M. Theumann, St. Fons, Assignors to Soc. Chim. des Usines du Rhône, Paris, France. U.S. Pat. 1,286,025, 26.11.18. Appl., 2.6.15.

See Eng. Pat. 8046 of 1915; this J., 1916, 39.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Cleaning and dyeing with volatile solvents. H. Hey. J. Soc. Dyers and Col., 1919, 35, 12—18.

THE solvents most generally employed in dry cleaning are petroleum spirit (benzine) and solvent naphtha; the chloro-compounds of hydrocarbons, though non-inflammable, are not satisfactory in other respects. One of the essential points in dry cleaning is the absence of "free" water. The solvents contain small proportions of water (0.2—0.3%) which may be deposited on cold surfaces; their capacity for holding water may be increased by using the solvents warm, or by adding "benzine soap." The latter also assists in holding the particles of dirt in suspension and preventing them from settling out upon the goods. In dry cleaning, the goods are first dried thoroughly with hot air and dusted. They are then treated systematically in baths of solvent of increasing cleanness. This treatment may be carried out in one machine connected with storage tanks for the different solvent baths, or in several machines, containing solvent of different degrees of purity, in which case the goods are moved from one machine to the next in closed wagons. The former method is preferable and the entire operation can be carried out in a closed system in an atmosphere of inert gas. Two systems are in common use: the Barbe system and Smith's system. The latter is distinguished by a particularly efficient type of machine consisting of a perforated inner cylindrical cage of steel revolving in an outer casing of iron. The shape of the cylinder is adapted for the advantageous utilisation of the minimum quantity of solvent, being large in diameter and short in length. The cage is divided radially into four compartments, each of which may be brought in succession opposite a door in the end of the casing for charging and discharging the goods. The goods are carefully sorted according to colour and condition, the lighter and cleaner materials constituting the first charge, and the darker ones being treated later. The casing is tightly closed, the air is pumped out, and a small amount of solvent admitted through a heater. The cage is slowly revolved with reversible gearing while the goods are tumbled about through the liquid at the bottom of the casing. The dirty liquid is discharged to the appointed tank and the cage is revolved at high speed, in one direction only, to drain the goods. The treatment is repeated with a fresh quantity of solvent which is collected in a separate tank. Altogether, three washes may be given, with a whizzing between each. The expulsion of the solvent by centrifugal force is so complete that not more than 5—7% of liquid is left in the goods and the latter may be removed without further treatment. They may, however, be dried in the machine, if desired, by circulating an inert gas through the casing in a closed circuit, containing

a heater and a cooler, by means of a fan. Dry dyeing is performed in a somewhat similar manner, but the principle is dependent on the presence of water in homogeneous solution. The incorporation of water is effected by the admixture of a common solvent of water and hydrocarbon, so that the dyestuff may be carried in solution. Suitable blending media are methylated spirit, ammonia and fatty acid, "benzine soap," formic acid, and latterly phenol or cresol (see Fort, this J., 1919, 9A). These miscible liquids are employed as solvents of the dyestuff and the concentrated solution is then diluted with the inert hydrocarbon. (See also Boursier, this J., 1887, 819; Farrell and May, 1908, 220, and Eng. Pat. 22,876 of 1910; this J., 1911, 889.)—J. F. B.

Woven fabrics; Influence of dyeing and finishing processes on — E. Midgley. J. Soc. Dyers and Col., 1919, 35, 20—23.

DURING the dyeing and finishing processes woven fabrics are subject to alterations in appearance, handle, strength, and elasticity, according to the type and quality of the raw material employed, the type and structure of warp and weft yarns, the structure and setting of the cloth in the loom, and the nature and degree of the processes of treatment. A number of systematic tests of tensile strength were applied to various types of wool fabrics, the strength and elasticity being determined after each of the operations involved in preparing, dyeing, and finishing. These established that, although there were slight fluctuations between one operation and another, the net result of the whole process was an appreciable loss of strength, particularly after crabbing, scouring, and permanent finishing. There is considerable scope for new effects by the suitable application of mechanical and chemical treatments of woollen fabrics, by which superior qualities may be imparted or union fabrics or even all-cotton fabrics substituted for wool. Among the most serious troubles in the dyeing and finishing industry are what are known as "crimps," which have their source in irregularities of shrinkage. This irregularity may either be inherent in the woven goods or may be introduced by uneven treatment in the wet processes of dyeing and finishing. A very troublesome cause of "crimps" in the original fabric has been traced to the recently introduced practice of artificially conditioning the weft yarn, whereby the outer layers of the spool tend to receive considerably more moisture than the inside.

—J. F. B.

PATENTS.

Wool-like effects on cotton fabrics; Process for producing — O. Klausner, Assignor to Akt.-Ges. Cilander, Herisau, Switzerland. U.S. Pat. 1,285,738, 26.11.18. Appl., 24.8.17.

See Eng. Pat. 103,432 of 1916; this J., 1917, 289.

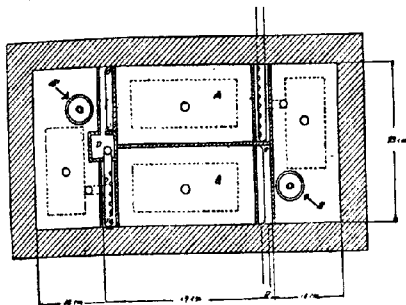
Chromium and iron compounds. Eng. Pat. 121,617. See VII.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Caustic alkali and chlorine; Electrolytic production of — by the mercury process. G. Yamazaki, Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 1097—1117.

THE author has devised an improved form of the Castner cell shown in plan in the figure. The cell differs from the ordinary Castner cell in that the

brine is decomposed in the middle compartment, containing the anodes, A, of Acheson graphite, whilst the sodium amalgam is made to circulate into the outer cathode compartments by the action of two worm screws, S, S, which revolve in small wells, and is decomposed by the water in the



compartments. By means of this cell, with a current density between 20.8 and 25.0 amp. per sq. dm. on the mercury, and a temperature of 45° to 50° C., pure 7 to 10 N-solutions of caustic alkali were obtained. The anode gas contained on the average 99.2% Cl, with 0.2% CO₂+O₂, 0.3% H₂, and 0.3% of other constituents. Even when the concentration of alkali in the amalgam reached 0.2%, the anode gas did not contain as much as 0.5% H₂.
—C. A. M.

Ammonium sulphate; Works experience in the manufacture of —. E. Wolff. J. Gasbeleucht., 1918, 61, 577–580.

THE impossibility of obtaining suitable material for the renewal of worn out parts of the plant, and the necessity of using sulphuric acid containing nitric acid, are among the war conditions which have made it difficult to maintain efficiency. At the Mannheim municipal gasworks, the indirect process is used. The saturator consists of a closed iron vessel, lined with lead and with acid-proof stone, and is joined by a connecting pipe of "chemical" lead to a smaller vessel, the supersaturator, also lead lined. A steam ejector of phosphor-bronze removes the liquor from the saturator, carrying it by means of a blow-over pipe through a receiving vessel and a sloping trough to a salt-box, provided with a sluice-valve, by means of which the mother-liquor is sent through a return pipe to the supersaturator, the salt being delivered through the sluice-valve to a hydro-extractor. The liquor from the extractor is also diverted to the supersaturator. Phosphor-bronze is no longer available, and when the corrosive action of the sulphuric acid produces a hole in the blow-over pipe the damaged part of the pipe is cut out, and the end of one of the sound parts is widened and forced over the end of the other part until fast, or the two parts are joined by a piece of lead piping, fastened by bronze bands. Steam and blow-over pipes of wrought iron, covered with lead and into which a lining of lead piping has been forced, have been recommended. A particularly vulnerable portion of the blow-over pipe is the elbow at the point at which the pipe turns towards the draining trough. A stoneware elbow with an iron cover has proved to be best. When the lead lining of the supersaturator was damaged, it was replaced by a lining of acid-proof stone, and the connection to the saturator was lined with a stoneware pipe, but these proved unsatisfactory. The supersaturator was therefore again lined with lead, but in the middle, over the lead lining, a thin iron sheet was placed, and screwed to the base, the screws and iron plate being finally covered with lead. This

arrangement prevented the lead lining from being torn up by the fluctuations of temperature. Stoneware was tried for the pipe carrying the vapours through the roof from the saturator, but it soon became very brittle, especially the part above the roof. Wrought iron covered with lead is recommended for the construction of the draining trough. The masonry foundation of the hydro-extractor is protected from the destructive action of the liquor by a covering of lead.—S. S. A.

Ammonium sulphate; Practical experience in the manufacture of —. E. Wolff. J. Gasbeleucht., 1918, 61, 601–604.

THE paper deals mainly with certain difficulties encountered in the manufacture of ammonium sulphate from ammoniacal liquor (see preceding abstract). The chief source of trouble is the increase in volume of the contents of the saturator due to the steam-ammonia supply containing too low a percentage of ammonia. Steam with an ammonia content of from 12 to 15% should be employed. Among other difficulties encountered are included the stoppage of the preheater with lime, and trouble due to the ammoniacal liquor containing tar. The use of 20% sulphuric acid is recommended.—J. S. G. T.

Spent oxide; Valuation and methods of analysis of —. H. G. Colman and E. W. Yeoman. Gas J., 1919, 145, 68–69, 112–113, 169–170.

THE method for the determination of the sulphur content employing carbon bisulphide as solvent gives high results, as certain tarry constituents of the mass are extracted along with the sulphur. A modification of the method whereby the extracted matter is treated with concentrated nitric acid, the sulphur being thereby converted into sulphuric acid, the tarry matters remaining undissolved, is capable of giving accurate results but is a tedious and unpleasant operation (compare Diamond, this J., 1918, 336r). The authors find that the method proposed by Davis and Foucar (this J., 1912, 100), in which the free sulphur is converted into thiocyanate by boiling with alcoholic potassium or sodium cyanide, affords accurate results, and a slight modification of the original procedure is detailed. The modified sulphuric acid method due to Marsden (this J., 1914, 909) also yields accurate results. In this method the combined sulphur and tarry matters extracted with carbon bisulphide are treated with 95% sulphuric acid at 100° C. for two or four hours. The authors find that separation of the sulphur from tarry matter can be achieved by shaking with 15 c.c. of 95% sulphuric acid for about a minute. About 2 grms. of the spent oxide should be employed, and details are given for carrying out the various methods with such an amount. Benzene may be used in place of carbon bisulphide, 200 c.c. being used for every gm. of sulphur extracted. The ammonia is determined by distillation with caustic soda solution as usual, a small flame being employed and steam passed in from a separate vessel. A number of analytical processes are detailed which taken together enable the separate cyanogen compounds to be determined quantitatively. These involve determination of combined ferrocyanide and carbonyl ferrocyanide, thiocyanate, and ferrocyanide proper, excluding carbonyl ferrocyanide (see this J., 1912, 468.)—J. S. G. T.

Alkaline carbonates; Physico-chemical method of estimating — in the presence of free alkali bases. Application to the analysis of flue gases. R. Dubrisay, Tripiet, and Toquet. Comptes rend., 1919, 168, 56–59.

If 50 c.c. of solutions of a definite alkalinity, containing varying proportions of sodium hydroxide and sodium carbonate, are mixed with 50 grms.

of phenol and heated until solution is complete, and then allowed to cool, the temperature at which the solution first becomes turbid is higher as the proportion of sodium carbonate to sodium hydroxide increases (see this J., 1919, 37A). Curves have been plotted for solutions having a total alkalinity of $2N$, N , $N/2$, and $N/4$. By means of these the amount of sodium carbonate in a given solution may be readily estimated by bringing the solution up to a definite alkalinity, proceeding as above, and then reading direct on the curve the amount of sodium carbonate corresponding to the temperature found. For the analysis of flue gases, one litre of the gases is slowly bubbled through 71.5 c.c. of $N/4$ sodium hydroxide, after which the above estimation is carried out.—W. G.

Ferric oxide; Direct determination of combined — in silicates insoluble in acid. O. Hackl. Chem.-Zeit., 1919, 43, 9.

In adapting Knecht's volumetric method of determining ferric salts by means of titanous chloride (this J., 1907, 1165) to the analysis of silicates, it was found that the hydrofluoric acid used for the decomposition of the mineral prevented the appearance of the colour reaction with the potassium thiocyanate used as indicator. The influence of hydrofluoric acid may be inhibited by adding boric acid to the solution before the titration; or methylene blue may be used as indicator instead of potassium thiocyanate.—C. A. M.

Chromic hydroxide; Evolution and oxidation of — in alkaline solution. F. Bourion and A. Sénéchal. Comptes rend., 1919, 168, 59–62.

An alkaline solution of chromic hydroxide undergoes a change on standing, which tends to make it lose all chemical activity, particularly in respect to its reducing properties, the change being more rapid, the greater the concentration of the chromium, and the smaller the concentration of the alkali. By adding from 4 to 5 times the calculated quantity of hydrogen peroxide to an alkaline chromium solution immediately after its preparation it is not possible to oxidise more than 90% of the chromium to chromate, but by adding the alkali to a mixture of the chromium solution and hydrogen peroxide, 97% of the chromium can be converted into chromate.—W. G.

PATENTS.

Nitric acid; Manufacture of —. C. Toniolo, Milan, Italy. Eng. Pat. 121,635, 27.12.17. (Appl. 19,139/17.)

Oxides of nitrogen are absorbed in water, in absorption towers arranged in series and worked on the counter-current principle. By means of refrigeration, using cooling coils or heat interchangers, the liquid is cooled so that it enters each tower at a temperature below 0°C ., or at temperatures comparable with the freezing points of the solution at different stages. The temperature of the liquor is reduced progressively as it travels to the end at which the gas enters, where the heat of reaction is greatest, thereby facilitating absorption, increasing the speed of production, and reducing the number of towers necessary. The process of refrigeration is particularly useful when using gas of comparatively high concentration of oxides of nitrogen, as when ammonia is employed as the source of the oxides.—S. S. A.

Phosphoric acid; Process for making —. W. H. Allen, Detroit, Mich. U.S. Pat. 1,285,575, 26.11.18. Appl., 27.5.18.

Phosphoric acid is produced by injecting a mixture of fuel, phosphates, and silica into a com-

bustion chamber containing steam by means of a blast containing oxygen.

Chromium and iron compounds [for use in dyeing, etc.]; Manufacture of —. T. J. I. Craig, and P. Spence and Sons, Ltd., Manchester. Eng. Pat. 121,617, 26.10.17. (Appl. 15,581/17.)

Solutions containing mixtures of chromium and ferric salts are produced by the reducing action of metallic iron, or of suitable iron compounds, upon compounds of chromium in solution. A solution containing a higher molecular proportion of chromium salt over ferric salt may be prepared, for example, by treating 56 parts by weight of sodium bichromate with an equal weight of water and 140 parts by weight of hydrochloric acid (sp. gr. 1.15), and adding an excess (20 parts by weight) of ground iron pyrites. A solution is thus produced, containing sulphate and chloride of chromium and iron, the molecular proportion of Cr_2O_3 to Fe_2O_3 being about 5:1. The degree of basicity or acidity is controlled by regulating the amount of acid used. To obtain a solution containing approximately equimolecular proportions of chromium and iron salts, metallic iron or ferrous sulphite is used as the reducing agent. Thus, 56 parts by weight of sodium bichromate is mixed with 220 parts by weight of hydrochloric acid (sp. gr. 1.15) and the chromic acid is completely reduced to Cr_2O_3 at a temperature below 70°C . Any excess of metallic iron is separated, and the remaining solution consists of a mixture of chromic and ferric chlorides in substantially molecular proportions. A preparation containing a higher molecular proportion of ferric salt over chromium salt is produced by the use of a ferrous salt the acid radicle of which has no reducing action on sodium bichromate under the conditions prevailing. For example, if 56 parts by weight of sodium bichromate is treated with 162 parts by weight of hydrochloric acid (sp. gr. 1.15) and 516 parts by weight of a solution of ferrous chloride, containing 13.5% of metallic iron, a mixture of chromium and iron chlorides is obtained, containing approximately 1 mol. Cr to 3 mols. Fe. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 4890 of 1896, 14,052 of 1897, 5902 of 1903, and 16,887 of 1907; this J., 1896, 901; 1898, 589; 1903, 959; 1903, 82.)—S. S. A.

Ammonia; Extraction of — from gases and vapours and the production of nitrogen compounds. E. L. Pease, Darlington. Eng. Pat. 121,754. (Appls. 13,560, 22.6, and 13,608, 21.9.17.)

The gases and vapours from gas producers, blast furnaces, etc., are passed upwards through a vessel into which is sprayed a solution of calcium or zinc chloride or other salt capable of forming a double compound with ammonia. Solid particles of soot, etc., removed from the gas, float on the solution and may be removed by means of a scraper. The solution from the absorption vessel is mixed with milk of lime, and the ammonia is distilled off. The residual liquid is filtered and used again as an absorbent. If the gases contain carbon dioxide, all horizontal projections must be avoided in the absorption vessel, as otherwise concretions of calcium carbonate will occur. Gases containing tarry matter may first be scrubbed with water and then treated with the salt solution or they may be treated directly with the latter. The hot ammoniacal solution may also be used for producing steam before being treated with milk of lime, and the ammonia-eliminating vessel may be combined with plant for producing nitric acid, nitric anhydride, or ammonium nitrate.—A. B. S.

Potassium-bearing silicates; Method of treating

— W. Glaeser, Brooklyn, N.Y., Assignor to Potash Extraction Corporation, New York. U.S. Pats. (A) 1,285,121, and (B) 1,285,122, 19.11.18. Appl., 8.3.15.

(A) FINELY divided potassium-bearing silicate, or the material resulting from heating potassium-bearing silicates, in lump form, to about 800° C. and then suddenly cooling, is intimately mixed with quicklime and coke, in the proportion of 100 parts of silicate to 80 parts of lime. This mixture is heated in the presence of steam and air, at a temperature above 700° C. (B) Finely divided potassium-bearing silicate, or the material produced by heating the lump silicate, suddenly cooling it, and grinding to pass a 100-mesh screen, is mixed with sodium phosphate in the proportion of 100 to 25, and the mixture is heated above 1000° C. —S. S. A.

Magnesium carbonate; Process of manufacturing

[light] — B. B. Grunwald, Redwood City, Cal., Assignor to National Magnesia Manufacturing Co., U.S. Pat. 1,285,683, 26.11.18. Appl., 20.5.16.

LIGHT calcined magnesite containing dead-burned magnesite is subjected to sedimentation in water to separate the latter.

Radioactive preparation. E. Heydenreich, Niederschönnewalde, Germany, Assignor to Kunheim und Co. and Allgemeine Radiogen A.-G., Berlin. U.S. Pat. 1,285,704, 26.11.18. Appl., 11.12.13.

A BLOCK of inert porous material, e.g., kieselguhr, having a cavity containing radiothorium, is arranged within a receptacle containing a liquid, e.g., an acidulated weak solution of sodium chloride, which will not dissolve radiothorium but will dissolve the thorium-X formed by self-decomposition of the latter. (See also Ger. Pat. 279,956; this J., 1915, 335.)

Sulphur in globular form, and process of producing the same. R. P. Perry, Upper Montclair, N.J., Assignor to The Barrett Co., U.S. Pat. 1,285,358, 19.11.18. Appl., 11.10.17.

MOLTEN sulphur is injected, in the form of a spray, into a cooling medium by which it is solidified in the form of small globular bodies, devoid of sharp edges such as would be produced by a fracture. The process is applied to the production of sulphur, in this form, from subterranean deposits, the sulphur being fused *in situ* by means of superheated water.—S. S. A.

Tungstic acid and acids of certain other acid-forming elements and salts thereof; Process of extracting — J. B. Ekeley and W. D. Stoddard, Boulder, Colo., U.S.A. Eng. Pat. 122,051, 24.1.18. (Appl. 1390/18.)

SEE U.S. Pat. 1,255,144 of 1918; this J., 1918, 206 A.

Alkali perborates; Process of making — O. Liebknecht, Frankfurt, Germany, Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,281,983, 15.10.18. Appl., 29.2.16.

SEE Eng. Pat. 102,089 of 1916; this J., 1917, 31.

Acid pots. Eng. Pat. 121,855. See VIII.

Reducing metallic compounds. U.S. Pat. 1,283,716. See X.

VIII.—GLASS; CERAMICS.**Optical glass; Effect of certain impurities in causing**

miliness in — C. N. Fenner and J. B. Ferguson. J. Amer. Ceram. Soc., 1918, 1, 468—476.

THE occasional production of milky optical glass was traced to the separation of clouds of minute crystals of cristobalite due to the catalytic action of small proportions of sulphate and chloride in the impure Russian potash which was used (*cf.* Turner and Cauwood; this J., 1917, 387). The defect was prevented by the use of a purer potash, containing not more than 0.3% SO₄ and 2.0% Cl, by prolonged stirring, more reliable control of the temperature, and by working at a slightly higher temperature. The devitrifying effect of the sulphates and chlorides present varies with the composition of the glass.—A. B. S.

Rational analysis of clays; Calculation of the

H. S. Washington. J. Amer. Ceram. Soc., 1918, 1, 405—422.

THE author assumes that clays are composed of four minerals corresponding to generalised formulae, viz.:—kaolinite (Al₂O₃.2SiO₂.2H₂O), orthoclase (K₂O.Al₂O₃.6SiO₂), albite (Na₂O.Al₂O₃.6SiO₂), anorthite (CaO.Al₂O₃.2SiO₂), ilmenite (Fe₂O₃.H₂O), with, in some cases, muscovite (K₂O.2H₂O.3Al₂O₃.6SiO₂), and recalculates the ultimate chemical analysis into the assumed minerals. The lime, soda, and potash are first calculated to the feldspars, and the alumina and silica required for these are deducted from the total. The iron oxide is calculated as ilmenite. Any surplus alumina is calculated as kaolinite, and any surplus silica is then regarded as quartz. The author states that clays form a mineral mixture of so simple a character that this method of calculation expresses the actual composition very accurately. —A. B. S.

Firebricks at furnace temperatures; Porosity and volume changes of clay

— G. A. Loomis. J. Amer. Ceram. Soc., 1918, 1, 384—404.

TEST-PIECES measuring 2½ × 1½ × 1½ in. were cut from firebricks, dried at 110° C., soaked in boiling water under vacuum for four hours, and the wet weight and "suspended weight" of the soaked bricks determined. The percentage porosity was found from the expression:—

$$\frac{\text{wet weight} - \text{dry weight}}{\text{wet weight} - \text{suspended weight}} \times 100.$$

The volumes of the test-pieces were determined to within 0.2 c.c. in a Seger voluminometer. In burning the test-pieces the temperature was brought rapidly to 280°—300° C., held for 3—4 hours to volatilise any oil, then raised to 800° C., and afterwards rapidly to 1200° C. From 1200° C. to 1500° C. the temperature was increased at the rate of 30° per hour. The porosity and final volume of the test-pieces burned at different temperatures were afterwards determined. The softening point of the same firebricks without a load and the reduction in height after exposure for 1½ hrs. at 1350° C. to a load of 40 lb. per sq. in. were also determined. Most of the firebricks which withstood the load test showed less than 3% change in volume and less than 5% decrease in porosity when burned at 1400° C. The majority of the bricks which failed under the load test showed greater changes in volume and porosity at some temperature below 1425° C. Bricks which are notably expanded and overburned below 1425° C. invariably fail under the load test. The changes in volume and porosity of bricks burned at some temperature between 1350° and 1425° C. give a fair

idea as to their ability to pass the load test, but no relation exists between the softening point with and without a load. The author suggests that the determination of the changes in volume and porosity before and after burning the samples at 1400° C. is quicker, simpler, and less costly (for a large number of samples) than the load test. For most purposes the volume may be measured sufficiently accurately by deducting the suspended weight from the wet weight of the sample, no voluminometer being required. The changes in porosity and volume after heating to various temperatures afford a means of determining the uniformity or otherwise in the quality of bricks, and of ascertaining the causes of failure, such as underburning or excessive shrinkage.—A. B. S.

Silica refractories. D. W. Ross. J. Amer. Ceram. Soc., 1918, 1, 479–501.

THE most suitable quartzites for silica bricks are those which in thin sections under the microscope show the interstitial impurities as sharply defined lines between the interlocking grains of silica. Those which show cloudy areas between the grains are less suitable for silica bricks. Sandstones which, when crushed, break down to individual sand grains yield an excess of grains of certain sizes. Moderately metamorphosed material when crushed follows the theoretical curve for minimum pore space (Taylor and Thompson, "Concrete, Plain and Reinforced," p. 775), and the breaking of the grains is chiefly through the interstitial material. In highly metamorphosed quartzites the breaking is chiefly through the grains, but some grains break away from the interstitial material. In the screened material from several well known American silica brick works, most of the original rounded grains which broke free from the interstitial material passed through a No. 30 sieve (0.503 mm.), the greater part being retained on a No. 40 sieve (0.381 mm.) and No. 60 sieve (0.221 mm.). The quartzites which when crushed break by fracture through the interstitial material or by the grains breaking away therefrom, produce more porous bricks than those in which the silica grains themselves are broken. In some cases, ground material should be sifted into three sizes, which are afterwards mixed in the desired proportions in a concrete mixer. By this means, the percentage of material of each grade is kept constant. The porosity of the finished brick depends on that of the unburned material. The conversion of quartz into cristoballite progresses from the surface and along cracks towards the interior, and is the most rapid in quartzites having the greatest surface areas, but above 1400° C. the transformation is so rapid that this effect is scarcely noticeable. Bricks which contain a large percentage of untransformed quartz, *e.g.*, those produced by heating to 1500° C. in one day, are friable and porous ("punky"), but by maintaining the kiln at 1250° C.—1350° C. until a large proportion of the quartz has been converted into cristoballite or tridymite and then finishing the burning at a higher temperature (14 days' heating in all), a strong brick is formed. Such a treatment should produce non-porous bricks of low specific gravity. The specific gravity of silica bricks readily shows the degree of conversion of the quartz and a comparison of the sp. gr.-temperature curves shows clearly the manner in which the lime present increases the amount of transformation produced by a given heat-treatment. Increasing the lime to above 2% also increases the rate of transformation. Sodium chloride has a similar effect, but clay, alumina, and iron oxide have little effect. The strength of moderately burned or underburned silica bricks—when cooled—depends largely on the glassy

bond formed by the action of the basic fluxes on the silica, and on the porosity of the raw material. Well-burned bricks have their strength increased by interlocking crystals of forms of silica of low specific gravity. The silica content should not be less than 94%; the alkalis should not exceed 0.5%. Iron oxide up to 1.6% does not appear to affect the refractoriness of the bricks. The limit for lime is usually said to be 2%, but larger amounts do not greatly lower the softening temperature. When ground and made into "cones" the softening point of the silica should not be less than that of cone 31 (1690° C.). The porosity of first-class American silica bricks is seldom below 23%, but a lower porosity may be desirable. When heated at 1500° C. under a load of 25 lb. per sq. in. a silica brick should not expand or contract linearly more than 1%.—A. B. S.

Magnesia; Sintering of — J. B. Ferguson. J. Amer. Ceram. Soc., 1918, 1, 439–440.

PURE, silky calcined magnesia which had been used as insulating material between the two heaters in a small electric resistance furnace of the cascade type was found to have formed a dense cake around the inner heater after the furnace had been maintained at 1600°–1720° C. for some hours. Under the microscope, the cake appeared to consist of periclase (crystalline magnesia) with less than 1% of forsterite ($2\text{MgO} \cdot \text{SiO}_2$) and no binder. The manufacture of magnesia ware without a binder therefore appears feasible if the product is fired at 1600°–1700° C.—A. B. S.

[Ceramic] ovens and kilns with high thermal efficiency. A. Bigot. Ceram. Soc., Jan. 9, 1919. [Advance proof.]

THE flue of a Perrot laboratory crucible furnace, 50 cm. x 31 cm. internal capacity, heated by several Bunsen burners, was built of refractory materials and surrounded by a pipe also of refractory material. Air drawn through the intervening space was used as a source of secondary air to the furnace. By this means, using 10 cb. m. of illuminating gas of inferior quality per hr., at a pressure of 40 mm., a temperature of 1750° C. was reached in 5½ hours. A small tunnel kiln 15 m. long has been erected in Paris, in which the "car" consists of one or more slabs of refractory material running on a series of balls, made of the same material, in a grooved track. The kiln is heated by illuminating gas of 8000 calories per kilo. by means of Bunsen burners, and by air passed through the cooling goods in the customary manner. This kiln at 1250° C. utilises 78% and at 1450° C. 70% of the available heat in the gas, and if lengthened sufficiently it would probably utilise 85%. It has been employed successfully for burning stoneware and clay products at 1250° C. with a fuel consumption of 50 kilos. per ton of fired products, for burning porcelain insulators at 1350° C. with a fuel consumption of 61 kilos. per ton, for porcelain insulators, cements, bauxite products, corindite, and chromite at 1450° C. with a fuel consumption of 75 kilos. per ton, for magnesia products at 1530° C. with a fuel consumption of 105 kilos. per ton, and for silica bricks at the same temperature with 130 kilos. of fuel per ton. The total period of burning from the setting to drawing does not exceed 5 hours. The output is 15–25 tons of material per 24 hours. Narrow tunnels are essential in order to make use of the radiant heat; for large outputs a series of tunnels should be used. The tunnel is completely surrounded by a porous insulating material. The tunnels may be fired direct, *i.e.* with the products of combustion distri-

buted among the goods, or muffled so as to protect the goods from contact with flame. Such kilns are suggested for reheating metals, enamelling, annealing glass, burning earthenware and other ceramic products, refractory bricks, crucibles, and chemical products.—A. B. S.

[Pottery] colours produced by the use of soluble metallic salts. P. G. Larkin. J. Amer. Ceram. Soc., 1918, 1, 429—435.

THE use of soluble colours greatly facilitates the production of polychrome effects in terra-cotta manufacture and saves labour. The ware is sprayed with a glaze or slip to be used as a base and the soluble salt solution is then applied by hand painting. The colours were produced by dissolving a suitable metallic salt (ferric nitrate, cobalt chloride, uranium nitrate, manganese nitrate, chromium nitrate with zinc chloride, nickel nitrate, copper nitrate, tin chloride, or zinc chloride) in a mixture of 3 vols. of water and 1 vol. of glycerin and mixing 100 c.c. of the solution with 10 c.c. of wood alcohol. In each case a 50% solution of the salt was used, with the exception of the chromium nitrate, of which only a 25% solution was used and 2% of zinc chloride was added to produce a salmon colour. Compound colours were prepared by mixing two or more of the solutions together. For greens, a mixture of two or more of the following was used:—ferric nitrate, cobalt chloride, uranium nitrate, nickel nitrate, copper nitrate, and manganese nitrate. For blues, cobalt chloride was mixed with iron nitrate, nickel nitrate, or manganese nitrate. Browns were made by blending two or more of the following solutions:—manganese nitrate, ferric nitrate, nickel nitrate, chromium nitrate, and uranium nitrate. Greys were obtained by blending cobalt chloride and a brown solution. Yellows and orange were made by blending three or more of the following solutions:—uranium nitrate, manganese nitrate, chromium nitrate, ferric nitrate. A little aniline dye was added to the solutions in order that the painted area might be recognised more easily. The addition of a lead frit to a standard finish engobe—making due allowance in the latter to prevent it becoming glossy—greatly improves the colours produced by soluble salts.—A. B. S.

Cast iron enamels; Antimony oxide as an opacifier in —. J. B. Shaw. J. Amer. Ceram. Soc., 1918, 1, 502—513.

ANTIMONY oxide has the same opacifying power as tin oxide and is much cheaper. Only the purest oxide should be used. The best colour was found in the enamels with the highest silica; it may be controlled by the addition of ferric oxide, manganese dioxide, and lead oxide. The most brilliant of the enamels made were those highest in silica and lowest in cryolite. Enamels containing neither lime nor cryolite are liable to froth when melting and no enamel of the types examined can be made in the absence of lime, lead, or cryolite, though not more than 3% of cryolite should be used. Part of the lime should be present as fluorspar, but not more than 5% of this should be used. The fusibility of these enamels is similar to that of the ordinary tin enamels, and the opacity is quite as good when the tin oxide is replaced by an equal weight of antimony oxide. The batch should be melted under exclusively oxidising conditions. Special attention should be paid to proportioning the raw materials; efficient mixing, and proper melting.

—A. B. S.

Enamel; Action of acetic acid solutions of different strengths on a sheet steel —. L. J. Frost. J. Amer. Ceram. Soc., 1918, 1, 422—428.

EQUAL volumes of solutions containing from 1 to 100% of technically pure acetic acid were evaporated to dryness in small weighed dishes, coated internally with an alkaline borosilicate enamel of the composition (0.885 Na₂O, 0.085 K₂O, 0.015 CaO, 0.015 MnO, 0.263 Al₂O₃, 2.291 SiO₂, 0.452 B₂O₃, 0.701 F₂). The dishes were then washed and scoured with a soft abrasive so as to remove any loose material, dried on a hot plate, cooled, and re-weighed. The results showed a considerable variation in the action of the acid, the greatest effect (0.0223 grm. loss) being obtained with a 24% solution. With the 4% solution ordinarily used for testing cooking utensils, the loss was 0.014 grm.

—A. B. S.

PATENTS.

Acid pots; Composition for the manufacture or lining of — or such like vessels. C. F. Curtis. Pontardawe. Eng. Pat. 121,855, 19.2.18. (Appl. 2904/18.)

THE pots are made of or lined with a composition the chief ingredient of which is a waste residue from furnaces in which pyrites has been burned, obtained in the form of a fine red powder. The following composition is suggested:—Sawdust 30%, Portland cement 30%, whitening 10%, waste residue 30%. The materials are mixed together and moistened. The mixture may be applied with a trowel to existing pots or moulded into any desired shape. The composition is also useful for the manufacture of electric fuse-boxes for use in coal mines.—A. B. S.

Furnaces and firebricks therefor. U.S. Pat. 1,285,244. See I.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Cast iron; Melting and freezing temperatures of the eutectic in iron-carbon alloys and the formation of grey —. R. Ruer. Z. angew. Chem., 1918, 31, 242—244.

By means of autographic heating and cooling curves taken during the repeated melting and freezing of a white cast iron—preferably with about 2½% carbon—direct proof has been obtained of the existence of two distinct eutectic arrests. The higher one which occurs at about 1153° C. is the austenite-graphite eutectic, and the lower one, at 1144° C., the austenite-cementite eutectic. Both arrests have been observed in the same curve and a gradual transformation from the upper to the lower horizontal, i.e. from white to grey iron, produced by repeated re-heatings. Proof is thus adduced that graphite in grey pig iron can separate out directly from the liquid phase and need not necessarily be the result of the decomposition of pre-existing cementite.—F. C. Th.

Aluminium alloys; Analysis of —. A. Travers. Chimie et Ind., 1918, 1, 708—711.

Two grms. of the alloy is heated with sodium hydroxide solution containing a small quantity of sodium carbonate; aluminium and zinc dissolve, whilst iron, copper, nickel, cobalt, calcium, magnesium, and the greater part of the manganese remain insoluble as hydroxides. The latter are separated by filtration and washed with dilute

alkali solution. The zinc in the filtrate is precipitated with sodium sulphide, the zinc sulphide is collected, dissolved in hydrochloric acid, and treated with an excess of ammonium chloride and ammonia to precipitate remaining traces of aluminium. The ammoniacal zinc solution is then neutralised and the zinc precipitated at 70° C. by the addition of an excess of ammonium sodium phosphate, $\text{NH}_4\text{NaHPO}_4$; the precipitate is collected, washed, and titrated with $\text{N}/5$ sulphuric acid, using methyl orange as indicator. Aluminium is determined in the filtrate from the zinc sulphide precipitate by Stock's method (Comptes rend., 1900, 130, 175; this J., 1900, 276). The precipitate consisting of the hydroxides of the other metals contained in the alloy is dissolved in nitric acid, the solution boiled with the addition of ammonium persulphate, then rendered ammoniacal, the precipitate collected, dissolved in hydrochloric acid, the solution boiled, and the iron determined by titration with titanium trichloride solution. Manganese and copper are determined in separate portions of the alloy, the former by the persulphate method and the latter iodometrically. Cobalt and nickel, if present, are separated as sulphides before the manganese is determined; cobalt is determined by precipitation with nitroso- β -naphthol. Magnesium is precipitated as ammonium magnesium phosphate in the filtrate from the iron and manganese precipitate, and the phosphate is then titrated.—W. P. S.

Arsenic; Determination of — in ferro-molybdenum and other alloys. O. Binder. Chem.-Zeit., 1918, 42, 619.

For the rapid estimation of arsenic in ferro-molybdenum, etc., the alloy is decomposed with nitric acid (sp. gr. 1.2) in a long-necked Kjeldahl flask, and the solution heated over a free flame with sulphuric acid until acid fumes cease to appear. The clear solution is then diluted with water, mixed with strong hydrochloric acid containing a ferrous salt, and the arsenious chloride distilled directly from the Kjeldahl flask.—C. A. M.

Ovens and kilns. Bigot. See VIII.

PATENTS.

Titaniferous iron material; Smelting —. Industrie-en Mijnbouw-Mij: "Titan," The Hague, Holland. Eng. Pat. 114,309, 15.3.18. (Appl. 4633/18.) Int. Conv., 15.3.17.

A portion of the intimately mixed charge of ore, flux, and reducing agent is smelted in an electric furnace either in the briquetted or unbriquetted state, whilst another portion is reduced in a shaft furnace, this latter charge being exclusively in the form of briquettes. The shaft furnace is heated either partially or completely by the combustible gases generated in the electric furnace. Calcium fluoride may be incorporated in the charge in the proportion of $\frac{1}{2}$ –2% of the total weight.—C. A. K.

Iron and steel surfaces; Protection of —. The Parkinson Stove Co., Ltd., and J. A. Thompson, Birmingham. Eng. Pat. 121,781, 24.12.17. (Appl. 19,057/17.)

For the production of a coating of magnetic oxide on iron or steel, the metal is heated in a gas furnace to 850°–925° C., a reducing atmosphere being maintained. Steam is then admitted to the furnace chamber through a number of pipes passing through the arch, and connected to a self-contained gas-heated steam generator by means of a horizontal main. The furnace is heated by means of

atmospheric burners, the gas burning in a longitudinal combustion chamber in the presence of secondary air.—C. A. K.

Steel from scrap; Production of —. W. G. Armstrong, Whitworth, and Co., Ltd., F. B. Trevelyan, and W. C. Rowden, Newcastle-on-Tyne. Eng. Pat. 121,785, 29.12.17. (Appl. 19,220/17.)

In the process of melting steel scrap, briquettes of carbon, pressed into a dense mass with pitch or other similar material, are first charged into the furnace. As the metal melts carbon is absorbed and "burning" of the metal is prevented.

—C. A. K.

Reducing metallic compounds; Process of — [with simultaneous production of cyanide]. H. Foersterling, Perth Amboy, N.J. U.S. Pat. 1,283,716, 5.11.18. Appl., 30.12.12. Renewed 28.3.18.

METALLIC oxides are reduced by a vaporised metal, e.g., sodium, in the presence of carbonaceous and nitrogeous matter. The reaction is carried out at a temperature suitable for the formation of the cyanide of the vaporised metal, and the reduction process is rendered substantially self-sustaining by the heat liberated in the formation of the cyanide.

—C. A. K.

Metallic composition [alloy]. G. P. Kline, Moline, Ill. U.S. Pat. 1,285,231, 19.11.18. Appl., 10.3.17.

An alloy of 80 parts of copper and 20 parts of lead, and containing not more than 2% of phosphorus.

—C. A. K.

Electroplating apparatus. L. Pothhoff, Flushing, N.Y. U.S. Pat. 1,285,369, 19.11.18. Appl., 31.1.16.

A ROTARY, perforated, tumbler barrel, of non-conducting and non-absorbent material, is mounted on a driving shaft at one end, and an "angularly adjustable" shaft passes through the other end, and is supported in a bearing on the inside of the driving end of the barrel. Adjustable cathode arms, of a material non-adherent to the metal to be deposited, are supported on the adjustable shaft, and means are provided for holding the arms stationary or permitting them to rotate with the barrel. The articles to be plated are suspended in contact with the cathode arms, and an anode member is supported outside the barrel.—B. N.

Lead; Method of refining —. P. Werner, Philadelphia, Pa., Assignor to R. Spicer, Willmar, Minn. U.S. Pat. 1,285,511, 19.11.18. Appl., 3.1.17.

A BATH of molten lead is subjected to the action of the products of destructive distillation of a resinous substance, e.g., by introducing amber into the molten metal. A layer of material is maintained on the surface of the bath to prevent oxidation of the surface metal.—C. A. K.

[Zinc] retort charging machines. W. J. Mellersh-Jackson, London. From Edgar Zinc Co., St. Louis, Mo., U.S.A. Eng. Pat. 112,119, 4.6.18. (Appl. 9233/18.)

Sintering ores; Methods and apparatus for —. J. Gayley, New York. Eng. Pat. 115,023, 14.3.18. (Appl. 4545/18.) Int. Conv., 30.3.17.

SEE U.S. Pat. 1,247,661 of 1917; this J., 1918, 62A.

Ores and solid salts; Treatment of — by electro-chemical reduction. A. A. M. Hanriot, Paris. U.S. Pat. 1,285,690, 26.11.18. Appl., 18.5.14.
SEE Fr. Pat. 469,516 of 1913; this J., 1915, 36.

Annealing metal wire by electricity. H. Alexander, W. T. Vint, and A. Imbery, Leeds. U.S. Pat. 1,285,887, 26.11.18. Appl., 6.6.18.
SEE Eng. Pat. 117,822 of 1917; this J., 1918, 589 A.

Case-hardening compound. L. C. Munn, Stourport. U.S. Pat. 1,286,061, 26.11.18. Appl., 12.2.17.
SEE Eng. Pat. 102,205 of 1916; this J., 1917, 38.

Extracting ammonia from gases. Eng. Pat. 121,754. See VII.

XI.—ELECTRO-CHEMISTRY.

Electrolytic production of alkali and chlorine. Yamazaki. See VII.

Electro-titrimetric analyses. Freak. See XXIII.

PATENTS.

Battery; Electric —. H. F. French and R. C. Benner, Fremont, Ohio, Assignors to National Carbon Co., Inc. U.S. Pat. 1,285,054, 19.11.18. Appl., 6.6.16.

The battery comprises a zinc electrode, and an electrolyte consisting of ammonium hydroxide and an alkali hydroxide.—B. N.

Electrolytic apparatus employing filmed electrodes. R. D. Mershon and J. S. Riddle, New York. U.S. Pat. 1,285,305, 19.11.18. Appl., 14.12.10. Renewed 18.5.18.

FILM-COATED aluminium electrodes (see Fr. Pat. 423,598; this J., 1911, 632) are wholly submerged in the electrolyte, with similar film-coated aluminium connecting devices attached to alternate electrodes, and extending outside the electrolyte for connection to an external circuit. A supporting frame for the electrodes is provided with non-conducting spacing members between the electrodes, parallel to the flow of current through the electrolyte, and with supporting members below the electrodes, these members being provided with spacing and supporting devices having tapered ends engaging the electrodes at parts of small area.
—B. N.

Electrode-holders for electric furnaces [; Water-cooled —]. C. W. Kayser and J. E. Robinson, Sheffield. Eng. Pat. 122,034, 12.1.18. (Appl. 729/18.)

Insulating mass especially for electric use. J. Andersen, Lillehammer, Norway. U.S. Pat. 1,285,889, 26.11.18. Appl., 1.6.16.

SEE Eng. Pat. 101,067 of 1916; this J., 1916, 971.

Electrical treatment of gases. Eng. Pat. 120,573. See I.

Carbonising coal, etc. Eng. Pat. 121,854. See Iib.

XII.—FATS; OILS; WAXES.

Shark and ray liver oils. M. Tsujimoto. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 1015—1042.

THE oil from the liver of the shark, *Imori-zame* (*Pristiurus pilosus*, Garman), had the highest iodine value of the liver oils of the 13 species of Japanese sharks examined. It had the following characters:—Sp. gr. at 15°/4° C., 0.8664; acid value, 0.32; saponif. value, 28.2; iodine value (Wijs), 309.0; refr. index (20° C.), 1.4912; unsaponifiable matter, 85.5%; insoluble bromides of fatty acids, 7.0%; and squalene, about 79%. The other shark-liver oils had iodine values ranging from 91.3 to 236.6. The oils of low sp. gr. (below 0.9 at 15°/4° C.) invariably contained the hydrocarbon squalene. Both the liver and egg oils of the sharks known as the frill shark, *Chlamydoselachus anguineus*, Garman, and kinbei-zame, *Lepidorhinus kinbei*, Tanaka (a new species), also contained squalene. It was not present in the liver oils of the five species of Japanese rays examined, nor in the liver oil of an elephant fish, *Chimara mitsukurii*, Dean.
—C. A. M.

Kaolin and alumina soaps; Determination of fatty acids in —. E. Alpers. Z. öffentl. Chem., 1918, 24, 247—250.

OWING to the absorptive capacity of alumina for oils and soaps the determination of fatty acids in soaps containing kaolin and alumina is liable to give low results. Thus in the case of a commonly used method in which the soap is boiled with alkaline alcohol, and the residue washed with alcohol and then extracted for several hours in a Soxhlet apparatus with the same solvent, it was found that the alumina residue still contained soap after 25 hours' extraction. Accurate results are given by the following modification of Thieme's method (Seifens-Zeit., 1916, 859):—Five grms. of the soap is heated on the water bath with sufficient water to dissolve the actual soap, and the solution treated with sufficient acid to reddens litmus paper. It is then mixed with sodium sulphate and evaporated to dryness, and the residue ground with sand in a mortar, and extracted for 12 hours with ether. The ethereal extract is evaporated, and the residue of fatty acids dried for half-an-hour in the water-oven, and weighed. The method requires modification in the presence of the fatty acids of coconut or palm-kernel oils, which must be weighed in the form of their potassium soaps.—C. A. M.

Wax of shuei flowers. Tsuchihashi and Tasaki. See XX.

PATENTS.

Fatty materials; Process of hydrogenating —. Hydrogenating unsaturated bodies. C. Ellis, Montclair, N.J. U.S. Pats. (A) 1,285,959 and (B) 1,285,960, 26.11.18. Appl., 21.10.15 and 24.3.16.

(A) LIQUID fatty oils containing unsaturated bodies are hydrogenised by atomising a mixture of the oil together with a fatty acid soap of a metal having catalytic properties, e.g. nickel, with hydrogen at a temperature at which the catalyst is active, i.e. reduced to the colloidal metallic condition. The unabsorbed hydrogen is separated from the hydrogenated oil product and the liquid fatty oil material again atomised with the unabsorbed hydrogen. (B) An improvement in the process of hydrogenating unsaturated organic materials in the presence of a colloidal catalyst is effected by employing hydrogen freed from oxygen and chlorine.—A. de W.

Soap and process of making the same. J. W. Bodman, Western Springs, Ill. U.S. Pat. 1,285,004, 19.11.18. Appl., 17.1.16.

THE compound consists of a non-liquid homogeneous mixture of an alcoholic soap mass and a hydrocarbon grease solvent, the proportion of the alcohol being less and that of the hydrocarbon more than 20% of the weight of the mixture.—W. P. S.

Oxidised products from fatty acids. Eng. Pat. 121,237. See XIII.

Treating fatty acids. Eng. Pat. 121,992. See XIII.

Linseed oil substitute. Eng. Pat. 122,015. See XIII.

Edible oils. Eng. Pat. 121,711. See XIXA.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Luminescence; Phenomena of —, more especially those connected with radioactive luminous paints. Bahr. J. Gasbeleucht., 1915, 61, 604—607, 614—616.

THE phenomena of photoluminescence are briefly reviewed and the theory of the subject based on the work of Lenard and Klatt is given. According to the theory, the photoluminescence of alkaline-earth sulphides results from their crystalline structure and the presence of small quantities of impurities such as bismuth, lead, and copper; with increase of atomic weight and of dielectric constant, the radiation emitted moves towards the region of longer wave lengths in the spectrum. The phenomena of radioactivity are briefly reviewed and the nomenclature employed in evaluation of radioactive substances scientifically and in commerce is explained. Self-luminous paints are produced by admixture of radioactive matter with zinc blende. The binding material usually employed consists of pure nitrocellulose lacquer. The intensity of the emitted light in the case of feebly luminous paints is proportional to the amount of α -radiation furnished by the radioactive substance per unit weight of the paint. The luminosity however reaches a limiting value as the concentration of radioactive substance is increased. The laws determining the efficiency of any definite mixture of zinc blende and radioactive matter are obscure. The life of such luminous paint is determined by the alteration of the blende, and not by the decay of the radioactive matter incorporated. There is no appreciable chemical alteration produced in the blende. For any given powdered zinc blende, there is a definite thickness of layer with which the maximum luminous effect is secured, and this best thickness is determined by the size of the crystal particles constituting the powder. The luminosity of a paint containing 1 mgrm. of radiothorium per grm. of blende, corresponds to that of white paper illuminated by light of intensity 0.7 lux. The radioactive content of the commoner paints varies between 0.01 mgrm. and 0.1 mgrm. of radiothorium per grm. Applications of luminous paints are discussed. Bloch has used a luminous paint as a comparison standard in photometry, measuring thereby lights varying in intensity between 1000 and 0.1 lux.—J. S. G. T.

PATENTS.

Varnish coating, dope, or lacquer; Manufacture of a plastic or solid material applicable also as a —. S. J. Peachey, Stockport. Eng. Pat. 121,091, 11.12.17. (Appl. 11,267/18.)

IN the manufacture of a plastic or solid material from rubber as described in Eng. Pat. 1894 of 1915

(this J., 1916, 479) the following solvents may be employed as alternatives to chloroform and carbon tetrachloride: alkyl, alkylene, alkenyl or aryl halides, such as trichloroethylene and tetrachloroethane.—E. W. L.

Varnish, lacquer, coating, or dope; Plastic or solid material, applicable also as a —. S. J. Peachey, Stockport. Eng. Pat. 121,194, 11.12.17. (Appl. 18,342/17.) Addition to Eng. Pat. 1894, 6.2.15 (this J., 1916, 479).

IN place of the chlorine used in the process described in the prior patent for the conversion of rubber into a plastic substance, sulphuryl chloride, or a mixture or succession of the two halogens, bromine and chlorine, may be used; and in place of the rubber balata or gutta-percha may be used.—E. W. L.

Fatty acids or their metallic salts; Treatment of — and manufacture of oxidised products therefrom. A. A. Lockwood and M. R. A. Samuel, London. Eng. Pat. 121,237, 14.3.18. (Appl. 4523/18.)

FATTY acids or their metallic salts, particularly those of linseed oil, are caused to react or combine with a borate; the fatty acids can then be oxidised with or without driers. For example, a mixture of the fatty acids with an equal weight of 10% borax solution is agitated and oxidised by a current of air and slowly heated to about 60° C. until suitable drying properties are acquired. Any of the usual substances employed in the manufacture of paint—such as litharge and metallic salts—may be added. Pale products may be obtained by treatment with calcium borate in the cold.—E. W. L.

Fatty acids; Treatment of — for use as oil mediums for paint and other purposes. A. P. Bevan, Liverpool. Eng. Pat. 121,992, 11.12.17. (Appl. 18,335/17.)

FATTY acids obtained by deglycerination of oils are treated, and in the case of linseed or analogous oils are rendered suitable as linseed oil substitutes for paint grinding and mixing or varnish manufacture, by reacting on them with calcium hydroxide or similar neutralising alkaline medium to such a degree as to inhibit solidification on mixing with pigments. A clear product is obtained by allowing the stearic acid and calcium stearate to separate by gravity or other means. For example, linseed oil fatty acids are heated to 160°—180° F. (71°—82° C.) and milk of lime in the proportion of 4%—7% by weight of dry Ca(OH)₂ on the fatty acids is added. The temperature is raised to 220°—230° F. (104.5°—110° C.) to drive off the water, the mixture being agitated meanwhile. The product is then allowed to stand at 70° F. (21° C.), with or without addition of 15%—20% of petroleum spirit, until clear, to separate stearic acid and calcium stearate. Addition of 3% by weight of cobalt resinate or other drier will produce a good drying oil.—A. de W.

Linoleum and the like; Manufacture of —. A. B. Craven, Selby, and The Yorkshire Dyeware and Chemical Co., Ltd., Leeds. Eng. Pat. 121,777, 20.12.17. (Appl. 18,891/17.)

THE resilient, tacky, and adhesive residue from the distillation, preferably *in vacuo* or in inert gas, of fatty acids from drying or semi-drying oils (except tung oil) or their glycerides, or waste products from their refining, is employed as a linoleum "cement" for admixture with cork dust, etc., for the manufacture of linoleum. Waste products from

oils may be subjected to a preliminary bleaching process, whilst fatty acids or their glycerides may be thickened by heating previous to distillation. The waste products should be free from products derived from non-drying oils for use in the process described.—A. de W.

Linseed oil substitutes for paints, varnishes, linoleum and the like; Manufacture of —. O. Wilkins and Co., Ltd., and W. A. Allsebrook, Derby. Eng. Pat. 122,015, 9.1.18. (Appl. 505/18.)

LINSEED oil substitutes suitable for the manufacture of paints, waterproofing compositions, linoleum, etc., are obtained by treating linseed oil fatty acids or products containing a proportion of the same with finely divided metals, e.g. iron, until partial saturation has taken place. Solution of the metal may conveniently be effected in the case of iron by allowing linseed oil fatty acids to percolate through a layer of iron filings in the presence of air, an iron content of 2–4% yielding a product liquid at ordinary temperatures and suitable as a paint medium, etc. A product containing 10% of iron is a solid elastic substance suitable for use in linoleum manufacture.—A. de W.

Varnish; Process for hardening —. C. A. Cutler, Buffalo, N.Y. U.S. Pat. 1,283,685, 5.11.18. Appl., 28.5.12.

THE film of varnish on varnished articles is hardened by placing the latter in a closed chamber having at one side a permeable wall, the air within the chamber being heated at the side opposite to the permeable wall. The heated air which rises is cooled by contact with the wall of the chamber, and a portion is forced through the permeable wall near the top of the chamber, whilst at the same time external air is drawn through the lower portion of the permeable wall, thereby regulating the "quality" of the air within the chamber.

—A. de W.

Impregnating process. R. W. E. Moore, Wilkesburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,286,057, 26.11.18. Appl., 19.2.14.

Porous material is moistened with a liquid of relatively low boiling-point, e.g. water, and is then treated under pressure with an impregnating liquid of higher boiling-point and immiscible with the moistening liquid, e.g. a melted waxy substance. The pressure at the time of treatment with the impregnating liquid is such that the moistening liquid cannot boil although at a temperature above its normal boiling-point. The temperature is then raised to the boiling-point of the moistening liquid at the working pressure and maintained until bubbling ceases.—A. de W.

Varnishes; Phenolic condensation product —. H. Wade, London. From Redman Chemical Products Co., Chicago, Ill., U.S.A. Eng. Pat. 122,027, 10.1.18. (Appl. 604/18.)

SEE U.S. Pat. 1,261,615 of 1918; this J., 1918, 433 A. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 3497 of 1911 and 9291 of 1914; this J., 1912, 347; 1915, 562.)

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Preparation and vulcanisation of plantation Para —. B. J. Eaton, J. Grantham, and F. W. F. Day. Agric. Bull., Fed. Malay States, 1918, No. 27, 398 pages.

A DESCRIPTION is given of the Malaya Experimental Testing Laboratory, together with a systematic compilation of the investigations which have emanated from this source; most of the experimental results have already been published in full or in abstract in this Journal (1913, 636; 1915, 889; 1916, 233, 264, 371, 715, 854, 1046, 1104; 1917, 16, 1116, 1217). The matters brought into consideration include the technique of vulcanisation methods, the variability of plantation rubber and its dependence on the conditions of coagulation, special processes for the preparation of raw rubber, and the acceleration of the vulcanisation of rubber by natural or artificial organic bases.—D. F. T.

PATENTS.

Ebonite, bakelite and such-like materials; Process for the manufacturing of a product substituting —. Naaml. Vennoot. Nederlandsche Maatschappij tot Exploit. van Optimietfabrieken, Assignees of S. van Raap, Amsterdam, Holland. Eng. Pat. 118,270, 13.6.18. (Appl. 9746/18.) Int. Conv., 14.8.17.

A SUBSTITUTE for ebonite, galalith, bakelite, and similar compositions is obtained by dissolving raw or vulcanised rubber waste in a drying oil, such as linseed oil, or in a vulcanisable oil, such as rapeseed oil, to which paraffin wax, stearin, resin, or similar materials have been added, and then introducing finely divided absorbent fillers, e.g., chalk, barytes, infusorial earth, and clay; after the addition of sulphur or other vulcanising agent and thoroughly mixing, the mass is vulcanised.

—D. F. T.

Rubbers; Processes for producing pigmented and products obtained thereby. W. J. Mellersh-Jackson, London. From India Rubber Co., New York. Eng. Pat. 120,824, 2.1.18. (Appl. 147/18.)

A DRY, finely-divided pigment, e.g. aluminium powder, is applied to the surface of a sheet of unvulcanised rubber, and is embedded in the surface by vulcanising the rubber in contact with a confining surface, such as a layer of metal foil, which may be reeled into a compact roll with the rubber before vulcanisation. A smooth glossy pigmented surface is thus produced.—E. W. L.

Rubber; Artificial —. E. R. Talley, Grinnell, Iowa. U.S. Pat. 1,285,463, 19.11.18. Appl., 12.9.18.

Two separate mixtures, one comprising a vulcanisable vegetable oil and resinous hydrocarbon bodies, and the other comprising a similar oil with fillers such as camphor and powdered shale, are blended together with the addition of sulphur, the mass being then vulcanised by heat and subjected to pressure after partial cooling.—D. F. T.

[Rubber] tyres; Method of treating old to produce new material. F. L. Harley, Folsom, Pa. U.S. Pat. 1,285,992, 26.11.18. Appl., 30.1.18.

THE rubber covering of old tyres is stripped from the fabric which is then subjected to heat and great pressure in order to compress the rubber particles with which it is impregnated and unite them firmly with the fabric. The resultant fabric stock is cut up into pieces, and the waste cuttings are ground up, spread over the pieces, and pressed together with them to form a built-up stock.—E. W. L.

Rubber; Compounding — with powdery substances. W. C. Knowlton and H. A. Hoffman, Akron, Ohio, Assignors to B. F. Goodrich Co., New York. U.S. Pat. 1,286,024, 26.11.18. Appl., 28.8.17.

POWDERY substances such as lampblack are converted into a granular form by mixing them with a concreting and binding liquid—*e.g.* water and a "binder"—drying the paste, and subdividing the mass into grains or lumps, which are then incorporated with the plastic substance (rubber) in a heated mixing mill.—E. W. L.

Plastic material. Eng. Pats 121,091 and 121,194. See XIII.

XV.—LEATHER; BONE; HORN; GLUE.

PATENTS.

Leather scrap; Making composition from —. H. E. White, Birmingham. Eng. Pat. 120,802, 7.12.17. (Appl. 18,176/17.)

LEATHER waste or scrap is treated with a relatively weak solution of acid, *e.g.* 10% hydrochloric acid, with or without salts such as magnesium sulphate or common salt, and is then heated either alone or with methylated spirit, olive oil, or other oil, or with gelatin, until it becomes a more or less homogeneous mass which may be mechanically worked into a desired form by rolling, extruding or the like, and then treated with hardening agents such as formaldehyde, chromium compounds, tanning extracts, synthetic or other tanning compositions, or picric acid alone or in conjunction with oils. Organic or inorganic filling materials may be added during the treatment.—E. W. L.

Hides; Process for tanning or impregnating —. K. Haring, Assignor to Anhydrit-Leder-Werke A.-G., Hiersfeld, Germany. U.S. Pat. 1,285,144, 19.11.18. Appl., 16.2.16.

HIDES are impregnated with a filling material, *e.g.* molten asphaltic material, while subjected to reduced pressure, and they may then be subjected to a pressure greater than atmospheric. The hides may be previously dehydrated by treatment with a suitable liquid.—D. W.

Glue-extracting process. F. J. Turner, Walpole, Mass. U.S. Pat. 1,285,474, 19.11.18. Appl., 13.12.17.

CHROME-TANNED leather or leather scrap is digested with an aqueous alkaline solution containing 0.75 oz. of caustic alkali per 1 lb. of dry leather, the mass is boiled until the glue substance is liberated, drained, and filtered clear. The glue solution, which is substantially free from chromium compounds, is evaporated to the desired viscosity.—D. W.

XVI.—SOILS; FERTILISERS.

Soil acidity as affected by moisture conditions of the soil. S. D. Conner. J. Agric. Res., 1918, 15, 321—329.

DIFFERENT types of acid soils were kept under different moisture conditions in pots for a year, at the end of which time it was found that the acidity varied with the different moisture conditions. Soils high in organic matter showed the greatest

acidity when kept fully saturated, soils low in organic matter when kept half saturated. The potassium nitrate extracts of the fully saturated soils (U.S. Dept. Agric., Bureau of Chem., Bull. 107, 1908) contained much larger amounts of ferrous iron than those from soils kept at a lower water content. In the case of mineral soils the fully saturated soils had much greater amounts of soluble manganese but less soluble aluminium than the other soils. The measurable acidity of acid soils varies to a large degree under the different conditions of moisture and aeration, these variations being due to chemical rather than to physical changes in the soil.—W. G.

Hydrogen-ion concentration—soil type—common potato scab. L. J. Gillespie and L. A. Hurst. Soil Sci., 1918, 6, 219—225.

THE authors find that the results from the electrometric (this J., 1916, 266) and colorimetric (see Clark and Lubs, J. Bact., 1917, 2, 1, 109, 191; also this J., 1915, 1226) methods of determining hydrogen-ion concentrations of soils agree within the limits of experimental error. It is necessary to add 1 or 2 c.c. of water per gram of air-dry soil, but this addition of water does not seem to be a serious limitation. Examination of a large number of soils showed a correlation between hydrogen-ion concentration and occurrence of common potato scab. Scabby potatoes were rarely produced on soils having a hydrogen-ion exponent as low as 5.2, but where the exponents were higher the soils generally did give scabby potatoes. The limiting zone of hydrogen-ion concentration for the scab organism is thus about the same for soil as for culture media. Further examination of a number of samples of Caribou and Washburn loams confirms the characteristic difference of hydrogen-ion concentration of these two types, the former having an exponent of about 4.8 and being free from scab, whereas the latter generally shows larger exponents and gives scabby potatoes.—W. G.

Aluminium; Presence of — as a reason for the difference in the effect of so-called acid soil on barley and rye. B. L. Hartwell and F. R. Pember. Soil Sci., 1918, 6, 259—279.

SEEDLINGS of barley and rye are equally affected by a given amount of acidity both in water and sand cultures, although rye will grow far more satisfactorily on an acid soil than will barley. Partial sterilisation of the soil by heat or antiseptics did not remove this difference in effect on the two crops. Various substances such as dihydroxystearic acid, manure extract, and ammonium sulphate, likely to be present in acid soils, were found to have an equal effect on barley and rye in water culture, and the aqueous extract of an acid soil affected barley and rye the same as did the acid soil itself. From a careful examination of the aqueous soil extract, it was shown that aluminium was the element responsible for the different influence on the plants. Equivalent amounts of aluminium sulphate and sulphuric acid when added to an optimum nutrient solution produced about the same depression of the growth of barley, and while a similar depression of the rye crop was obtained with the acid, the aluminium sulphate caused very little depression and scarcely affected the rye roots. Further, as the hydrogen-ion concentration of the nutrient solution containing the aluminium sulphate was only about one-fourth of that containing the sulphuric acid it was concluded that aluminium exerted a toxic effect on the barley. This active aluminium may be largely removed from the soil solution by the application of lime or phosphates, even acid phosphates (superphosphate).—W. G.

Aluminium; Influence of — on the germination of seeds and the development of plants. J. Stoklasa, J. Sebor, W. Zdobnický, F. Týmich, O. Horák, A. Nemeš, and J. Cwacch. *Biochem. Zeits.*, 1918, 91, 187–223.

A VERY detailed investigation on the action of aluminium, manganese, and iron ions on the germination of seeds, and on the growth of seedlings when present in the nutrient medium. Generally it was found that aluminium and manganese have a favourable effect in small amounts, but in larger quantities they are toxic. The toxicity of manganese can to an extent be counteracted by aluminium when the latter does not exceed a certain quantity. The investigations on growth refer to the action on xerophytes (to which aluminium is very toxic), hydrophytes, and hydrophilis (which are relatively very resistant to aluminium). As regards mesophytes a toxic action could be determined in the case of iron ions which could be counteracted by aluminium. The paper contains a large amount of theoretical discussion on the mechanism of growth and the intensity of physiological action of the various ions. (See also *J. Chem. Soc.*, 1919, 1, 109.) —S. B. S.

Soils; Determining the absolute salt content of — by means of the freezing-point method. G. J. Bouyoucos and M. M. McCool. *J. Agric. Res.*, 1918, 15, 331–336.

It is found that at a comparatively high moisture content the influence of the "unfree" water on the concentration of the soil solution is practically negligible. Based on this the following procedure has been adopted for making a comparative study of the absolute salt content of all kinds of soils. 15 grms. of the air-dry soil is poured into a freezing tube containing 10 c.c. of distilled water, and the freezing-point is determined in the usual manner. From the depression the salt content of the soil in parts per million can readily be calculated. In the case of light soils it is better to use 20 grms. of soil to 10 c.c. of water and for alkali soils 1 grm. of soil to 5 c.c. of water.—W. G.

Soil factors affecting the toxicity of alkali. F. S. Harris and D. W. Pittman. *J. Agric. Res.*, 1918, 15, 287–319.

THE authors have made some 12,000 determinations of the effect of sodium salts on the germination and growth of wheat under different conditions. In sand cultures the toxicity of the alkali is not influenced by the size of the particles. Loam soils are more tolerant of alkali than either sand or clay, but in the case of coarse and fine loams, the moisture content is the important factor in controlling their tolerance as indicated by the behaviour of the seedling. Organic matter increases the resistance of the plant to alkali when the soil is given sufficient moisture, but if the content of organic matter is high and the moisture supply is low the resistance is diminished. As a general rule increasing the moisture content of a soil up to the maximum that will produce good crops increases resistance to alkali. The toxicity of sodium chloride and sodium sulphate seems to depend to some extent on the relation between concentration of salt and percentage of moisture present, whilst the toxicity of sodium carbonate is more largely affected by the presence of organic matter, which seems actually to remove sodium carbonate from the soil solution in large quantities.—W. G.

Actinomyces in the soil; Occurrence of —. S. A. Wakeman and R. E. Curtis. *Soil Sci.*, 1918, 6, 309–319.

AN examination of 25 soils of North America and the Hawaiian Islands shows that on the average the actinomyces form 17% of the total flora of

bacteria and actinomycetes. Heavy soils and those rich in undecomposed organic matter are, as a rule, relatively richer in actinomycetes than corresponding lighter soils or soils poor in undecomposed organic matter. In the case of one soil, which was acid and covered with water for a large part of the year, the percentage of actinomycetes (on the total bacterial flora) fell to as low as 3.5. Many species of actinomycetes were isolated from the different soils examined.—W. G.

Soil; Organic phosphorus of —. R. S. Potter and R. S. Snyder. *Soil Sci.*, 1918, 6, 321–332.

THE authors dispute the conclusions of Gortner and Shaw (this *J.*, 1917, 606) that their method (see *Soil Sci.*, 1916, 2, 291) does not distinguish between absorbed and organic phosphorus in humus of soil. No organic phosphorus was found by their method in a subsoil containing colloidal clay in considerable amount but no organic matter. Thus their original results were not due to colloidal clay as Gortner and Shaw suggest. An examination of the curves for the hydrolysis of phytin and of nucleic acid by 5% sulphuric acid at 100° C. shows that both of these reactions are of the first order. No definite conclusions could be drawn from the curves for the hydrolysis of the organic phosphorus of three soils, but the direction of the curves was such that the organic phosphorus might have been due to phytin or to a pyrimidine nucleotide.—W. G.

Plant-food within the soil; Movement of —. E. van Alstine. *Soil Sci.*, 1918, 6, 281–308.

FROM an examination of the three successive layers of the soil on the various permanent "Park" grass plots at Rothamsted, and of the 4-year rotation plots at the Pennsylvania State College, and the 5-year rotation plots at the Ohio Agricultural Experiment Station, taking into account the fertilisers applied over a long period of years, and of the yield and composition of the crops during that time, the author concludes that phosphorus, when applied as a fertiliser, remains almost at its place of application in the soil, until removed in crops or by erosion. The utilisation of phosphates from the surface layer, particularly by leguminous crops, is encouraged by the application of alkali salts. During the growing season with crops on land kept in good condition, the loss of nitrogen by drainage is very small, there being a tendency for nitrogen, added in the form of ammonium salts, to accumulate in the surface soil. Potassium is liable to movement within the soil as a result of the application of other fertilisers and may thus be leached beyond the reach of plant roots. Loss of magnesium is brought about by the use of ammonium salts as fertilisers. Calcium decreases with loss of carbonates, and application of alkali salts and ammonium salts also causes the loss of calcium from the soil.—W. G.

Potash; Solubility of the soil — in various salt solutions. D. K. Tressler. *Soil Sci.*, 1918, 6, 237–257.

CALCIUM sulphate increases the solubility of soil potash to an appreciable extent in some soils, whereas tricalcium and dicalcium phosphate have little or no action on the solubility of the soil potash and monocalcium phosphate appears to diminish the solubility. The action of calcium sulphate is more marked on the clay fraction of the soil than on the silt or sand. Solutions of carbon dioxide or calcium bicarbonate increased the solubility of the soil potash in a Dunkirk silt loam. Sodium salts are quite active in dissolving potash from soils, and the influence of sodium chloride increases with its concentration in the soil solution.—W. G.

Azofication [in soils]. J. E. Greaves. *Soil Sci.*, 1918, 6, 163—217.

A SUMMARY of the literature on the subject of nitrogen fixation by *Azotobacter* and *Clostridium pasteurianum*.—W. G.

"Chlorine index" as a comparative measure of the richness of soils in humus. L. Lapique and E. Barbé. *Comptes rend.*, 1919, 168, 118—121.

WHEN a quantity of soil is shaken with sodium hypochlorite solution, the hypochlorite is decomposed to an extent varying with the character of the soil. The "chlorine index" of the soil is taken as the volume of active chlorine which disappears when 10 c.c. of the soil is shaken with 50 c.c. of aqueous sodium hypochlorite (5 or 10 vols. of chlorine) for half an hour. This index affords a means of classifying soils in the order of their probable richness in humus, as it is found to vary directly with the humus content of certain known soils.—W. G.

Soil; Absorbent power of dry or moist — with respect to chlorine gas. D. Berthelot and R. Trannoy. *Comptes rend.*, 1919, 168, 121—123.

DRY sand, whether white or ferruginous, has a very low capacity for absorbing chlorine, but a peaty soil or leaf mould shows marked absorptive powers. The addition of 10% by weight of water either to the sand or to the soil markedly increases the absorption of the gas, but any further addition of water is without effect except so far as the added water dissolves some chlorine.—W. G.

Humic acids. Marcusson. See IIA.

PATENT.

Potassium from flue-dust; Process of extracting combined —. E. W. Haslup, Bronxville, N.Y., Assignor to Haslup and Peacock, Inc., New York. U.S. Pat. 1,285,152, 1919.11.18. Appl., 15.12.17.

FOR the preparation of crude potassium compounds suitable for use as fertilisers from flue dust containing potassium sulphides and silicates, the dust is treated with magnesium chloride solution to decompose the potassium sulphides present, and extract the soluble potassium compounds. The insoluble residue, containing potassium silicate, is separated, and digested with hydrated calcium sulphate, thereby obtaining potassium sulphate. —S. S. A.

XVII.—SUGARS; STARCHES; GUMS.

Determining copper. Kolthoff. See XXIII.

PATENT.

Adhesive material [from maize cobs]; Process of manufacturing an —. F. B. La Forge, Washington, D.C. U.S. Pat. 1,285,247, 1919.11.18. Appl., 13.4.18. (Dedicated to the public.)

CORN (maize) cobs are heated under pressure in water to dissolve colloidal matter; the colloidal solution is separated by pressure from the insoluble residue and concentrated to the consistence of a thick syrup.—J. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Wine; Analysis of —. Detection of cider, currant wine, etc., in wine. W. Schulte. *Chem.-Zeit.*, 1918, 42, 537—539, 537—538.

THE ordinary analytical data do not afford a means of detecting the presence of cider in wine, or even, in some cases, of distinguishing wine from cider. Wine, however, contains a considerable quantity of tartaric acid which is present in traces only in cider, gooseberry wine, currant wine, etc. Six genuine wines examined contained from 0.1535 to 0.2775 gm. of tartaric acid per 100 c.c., whilst the quantity in 8 samples of cider, gooseberry and currant wines varied from 0.0045 to 0.0486 gm. Wine does not contain citric acid, but this acid is present in cider, etc. The following procedure is recommended for the detection of tartaric acid:—20 c.c. of wine is treated with 1 c.c. of saturated calcium acetate solution and the mixture is placed aside for 24 hrs.; characteristic crystals of calcium tartrate are deposited. Such crystals are not given by cider or "berry" wines. If the clear liquor is then decanted from the crystals and mixed with an equal volume of 95% alcohol, the calcium salt of an unidentified acid is deposited. This calcium salt resembles calcium citrate in that it is soluble in water and insoluble in 45% alcohol, but the form of the crystals is quite different. The acid occurs in wine (0.076 to 0.331 gm. per 100 c.c.) but not in cider or "berry" wines. A further test for distinguishing between wine and cider, etc., consists in mixing 2 c.c. of the sample, 7.5 c.c. of water, and 0.5 c.c. of lead acetate solution in a graduated tube and allowing the mixture to settle for 24 hrs. In the case of wine the volume of the sediment will be from 25 to 42% of the volume of the mixture; with cider the sediment will be 4 to 20% of the total volume, whilst gooseberry wine gives 27 to 41% of sediment. If 10 c.c. of wine is treated with 10 c.c. of alcohol and 0.5 c.c. of saturated calcium acetate solution, the sediment produced will amount to 22 to 51% of the total volume; with cider, the sediment measures only 2 to 15% of the total volume. If 5 c.c. of wine is mixed with 10 c.c. of water and 5 drops of ammonia, a yellowish or violet coloration is produced and the mixture becomes slightly turbid; cider, under these conditions, yields a much stronger coloration but usually remains clear. (Compare also Pratolongo, this J., 1918, 745 A.) —W. P. S.

Glycerol in wines; Estimation of —. M. Canónica. *Anal. Soc. Quím. Argentina*, 1918, 6, 94—101.

THE method proposed has been tested on wines with low and also with high sugar content before and after the addition of a known quantity of glycerol; also with wines containing no sugar before and after the addition of 1% of sugar, and has been found to give concordant results. The technique of the method varies slightly according to the sugar content of the wine, the variation affecting chiefly the extent to which the preliminary evaporation is carried. 50 c.c. of the wine is acidified with a few drops of sulphuric acid, about 100 grms. of lead shot is added, and the solution is evaporated on the sand bath to about 3 c.c. 2–3 grms. of finely powdered slaked lime is added, and by rotation of the shot a fine homogeneous paste is produced. After a few minutes the glycerol is extracted with a mixture of alcohol and ether (1:1.75 by vol.), the residue washed by decantation, and the extract and washings are filtered and distilled to remove the solvent. The syrupy residue is dried at 70° C., cooled, and weighed. The impurities in the glycerol thus determined may be estimated by dissolving the residue in a

little water in a platinum crucible and evaporating to dryness on a sand bath at 130° C. The weight of the final residue is deducted from that already found. In the case of wines containing over 2% of sugar the procedure varies in that the lime paste first formed is extracted thoroughly with hot alcohol and filtered. The extract is then treated as a wine with low sugar content.—W. S. M.

Alcohol, etc.; Use of mucedines in the production of —. P. Baud. *Chimie et Ind.*, 1918, 1, 699—707.

DURING recent years the use of moulds (*Mucor* Boulard No. 5; see this J., 1914, 497) for the saccharification of carbohydrates has extended considerably, having been adopted by more than 24 works; the quantity of alcohol produced by this means was 10,000 hectolitres in 1914 and 182,962 in 1917. *Mucors* may also be used in the preliminary saccharification in the manufacture of vinegar.—W. P. S.

Ether in ethyl alcohol. Cox. See XX.

PATENTS.

Phlegms or wines and fermented musts; Apparatus for the rectification of —. E. Barbet et Fils et Cie., Paris. Eng. Pat. 121,797, 10.6.14. (Appl. 19,326/17.) Addition to 14,041/14 (see Fr. Pat. 470,242; this J., 1915, 194).

A HEAT regenerator is added to the original apparatus in which circulate, on the one hand, the phlegms before admission to the purifying and concentrating column and, on the other hand, the residual waters from the rectifying column. Further, there are fitted steam-inlet valves for the purifying and concentrating column and for the rectifying column, also plugs between the purifying column for the forerunnings and the purifying and concentrating column and between the exhaust column of the musts and the rectifying column, the whole being arranged in such a way that, by merely operating the valves or plugs, the purifying column for wines and the exhaust column for musts, as well as the two differential regulators, may be put out of use, while the two ordinary regulators are employed for regulating the admission of steam to the phlegm purifying and concentrating column and to the rectifying column. Thus the continuous distilling and rectifying apparatus for wines and musts may be transformed at will into a continuous rectifying apparatus for phlegms.—J. F. B.

Brewing. E. Moufang, Kirn, Germany, Assignor to Nathan-Institut A. G., Zurich, Switzerland. U.S. Pat. 1,286,055, 26.11.18. Appl., 11.5.17.

See Ger. Pat. 301,830 of 1915; this J., 1918, 346A.

XIXA.—FOODS.

Bread; Changes during the baking of —. II. Mohordt. *Arch. Hyg.*, 1917, 86, 241. *Chem.-Zeit.*, 1919, 43, Rep., 1.

A BREAD-BAKING test was made with 1595 grms. of flour (equal parts of wheat and rye flours), 100 grms. of pressed yeast, 50 grms. of salt, and 1000 grms. of water. The following changes were noted: Pentosans and rhamnosans were hydrolysed to pentoses and rhamnose. A loss of flour substance occurred in respect of starch and pentosan, amounting to 1.88% on a flour containing 13% of moisture. During the fermentation of the dough a new formation of fat took place as a result of the growth of the yeast.—J. H. J.

Milk; Sterilised, bake-house, "enzyma," and "uvioi." —. K. Müller. *Zentr. Bakt.*, 1917, 47, 385. *Chem.-Zeit.*, 1919, 43, Rep., 1.

IN sterilised infants' milk and bake-house milk there were as a rule by far fewer organisms than in pasteurised and raw milk, but still about 50,000 per c.c. In "enzyma" milk and "uvioi" milk, in about 45% of the samples there were found more than 50,000 organisms per c.c. Streptococci characteristic of mastitis were found in sterilised infants' milk, bake-house milk, and "uvioi" milk, but not in "enzyma" milk. Sediment was least in "enzyma" milk. Milk-souring bacteria were absent in sterilised milk, but present in the other cases. Enzyme reaction was negative in sterilised milk and bake-house milk, but positive in "uvioi" and "enzyma" milk. Pathogenic bacteria were not found. The author considers that milk pasteurised in bottles for $\frac{1}{2}$ hr. at 63° C. has the advantage that subsequent infection is prevented. The high price of "uvioi" milk is not justified by the poor results obtained.—J. H. J.

Cacao shell; Determination of —. A. W. Knapp and B. G. McLellan. *Analyst*, 1919, 44, 2—21.

THE various processes for the determination of cacao shell in cacao powder are reviewed and described in detail and each has been subjected to critical investigation, the results of which are given. The authors are of opinion that the only method which, employed by itself, can give results of any value is the determination of crude fibre. Even this method has faults and necessitates consideration of the amount of crude fibre in cacao shell itself; this quantity may vary from 15.4 to 21.4% of the dry, fat-free substance, the average being 18.7%. The average amount in cacao powder may be taken as 5.8%. No process will determine as low a proportion of husk as 5%; if 8% is deducted from the shell percentage found, the cacao powder under examination will contain at least the remainder. The other methods examined included the determination of the nitrogen, elutriation and flotation methods, pentosan method, microscope methods, "cacao-red method," ash, soluble silica, iodine value of fat, cold water extract, etc. (See this J., 1908, 637; 1910, 369; 1911, 1466; 1918, 488A.)—W. P. S.

Silica and sand; Determination of — [in feeding stuffs]. F. J. Lloyd. *Analyst*, 1919, 44, 27—28.

TO differentiate between sand and silica in the ash of a feeding stuff or similar substance, 2 grms. of the sample is incinerated at a low heat, the ash extracted with hydrochloric acid, and the insoluble portion collected and weighed; it represents the silica and sand together. Another portion of 2 grms. of the sample is also incinerated and the ash boiled with 10 c.c. of 10% sodium hydroxide solution; after dilution, the insoluble matter is collected, washed, ignited, digested with hydrochloric acid, again collected, ignited, and weighed; this gives the "sand" as distinguished from "natural silica."—W. P. S.

Silica and sand; Determination of — [in feeding stuffs]. B. Dyer. *Analyst*, 1919, 44, 28.

IN the determination of sand and "natural" silica in Indian rice bran (which may contain 20% or more of "natural" silica) the author prefers to use sodium carbonate in place of sodium hydroxide as recommended by Lloyd (preceding abstract). The total silicious matter (ash insoluble in boiling hydrochloric acid) is weighed and then boiled with 100 c.c. of 10% sodium carbonate solution, the mixture filtered, and the residue washed, ignited, and weighed.—W. P. S.

PATENTS.

Food preparations consisting of cereals and milk; Preparing and preserving —. W. H. Stevens, Portland, and S. C. Dunlap, Amity, Oreg., U.S.A. Eng. Pat. 115,618, 7.1.18. (Appl. 380/18.) Int. Conv., 2.5.17.

MILK is heated at 160°–170° F. (71°–77° C.) for 15 mins., and after cooling is mixed with 2 oz. of cleaned rice for every 13½ oz. of milk. The mixture is placed in a can, which is hermetically sealed, and sterilised at 236° F. (113° C.) for 20 mins., the can being agitated during the process. After removal from the steriliser, the can may be placed in a shaking machine for a few minutes.

—J. H. J.

Cereals, nuts, seeds, and the like; Sterilising —. J. W. C. Hamilton and E. W. Quirk, Liverpool. Eng. Pat. 121,650, 10.1.18. (Appl. 585/18.)

THE grains, seeds, etc., are passed through a chamber where they are subjected to the action of formaldehyde vapour under slight pressure. The rate of movement of the conveyors is such that the seeds are in contact with the vapours for about 1 min.—W. P. S.

Edible oils and fats; Means for imparting a definite flavour and aroma to —, and edible oils and fats so treated. J. de Bruyn, London. Eng. Pat. 121,711, 12.8.18. (Appl. 13,091/18.)

A SUBSTANTIALLY fat-free meal prepared from the seeds or fruits of leguminous plants, palms, etc., is heated at 130° to 195° F. (54° to 88° C.) for 10 to 30 mins. with water containing a small quantity (0.05 to 0.2%) of alkaline salts; the mash is then passed through a coarse wire sieve, cooled to 70° F. (21° C.), and treated with pepsin, pancreatin, or rennin, and a culture of lactic bacteria, preferably *Streptococcus lacticus*. Three oz. of pepsin is added to each 1000 gals. of liquid containing 3 to 4% of crude protein. The mixture is stirred until the desired degree of acidity has been produced, and is then emulsified at 70° to 100° F. (21° to 38° C.) with edible oils or fats; the quantity of the mixture used should be from 10 to 30% of the total emulsion. If desired, the mash obtained from the nuts may be dried under reduced pressure; the powder obtained can be stored for a long time, and is mixed with water, pepsin, etc., when required for use.—W. P. S.

Bread and other food products and processes for producing same. R. Graham, Cupar, Scotland. Eng. Pat. 116,272, 1.5.18. (Appl. 7300/18.) Int. Conv., 28.5.17.

SEE U.S. Pat. 1,264,876 of 1918; this J., 1918, 439 A.

XIXB.—WATER PURIFICATION; SANITATION.

Absorption of chlorine by soil. Berthelot and Trannoy. See XVI.

Electro-titrimetric analyses. Frenk. See XXIII.

PATENTS.

Water-softening reagent; Process of manufacturing a —. F. Blumenthal, Cologne-Braunsfeld, Germany. U.S. Pat. 1,285,603, 26.11.18. Appl., 3.1.18.

A SOLUTION of iron salts is precipitated by means of water-glass, and the precipitate is treated with a hot solution of an alkali with the object of increasing its capability of exchanging the base.

—J. H. J.

Sewage and analogous liquids; Apparatus for purification of —. W. Jones, Stourbridge. U.S. Pat. 1,282,587, 22.10.18. Appl., 7.11.16.

SEE Eng. Pat. 19,916 of 1914; this J., 1915, 632.

Sewage and analogous liquids; Purification of —. W. Jones, Stourbridge. U.S. Pat. 1,286,017, 26.11.18. Appl., 18.10.15.

SEE Eng. Pat. 22,736 of 1914; this J., 1915, 195.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Morphine in complex products; Determination of —. III. Opium and mixtures containing opium. A. Tingle. Amer. J. Pharm., 1918, 90, 851–861. (See this J., 1919, 27 A, 54 A.)

THE methods described previously (*loc. cit.*) cannot be applied to the determination of morphine in opium owing to the presence of resinous matters in the latter. These are precipitated and extracted together with the morphine, but may be separated by digesting the aqueous solution with salicylic acid, and cooling the mixture; the resins are, for the greater part, precipitated, and the morphine may be further purified by re-solution and extraction with a chloroform-alcohol mixture. The details of the method are as follows:—6 grms. of the opium is mixed with 2 grms. of calcium carbonate and a small quantity of water and heated for 10 mins. on a water-bath; after cooling, 60 c.c. of cold saturated barium hydroxide solution is added, the mixture shaken occasionally during 30 mins., then diluted to 100 c.c., and filtered. Fifty c.c. of the filtrate is rendered slightly acid with sulphuric acid (1 : 5), then slightly alkaline with sodium hydroxide solution, and solid salicylic acid is added, in small quantities at a time, until the mixture has an acid reaction; an excess of 0.5 gm. of salicylic acid is then added, the mixture heated in boiling water for 10 mins., cooled, diluted to 55 c.c., and filtered. Fifty c.c. of the filtrate is evaporated almost to dryness, the residual solution diluted to 5 c.c., and 5 c.c. of chloroform and about 3 drops of ammonia are added; the distinctly alkaline mixture is stirred, set aside for 4 hrs., and the precipitate then collected on a cotton-wool filter and washed with about 10 c.c. of water (this may be saturated previously with morphine). The impure, yellowish morphine thus obtained is dissolved in dilute sulphuric acid, the cotton-wool filter is washed with water, and the solution, measuring not more than 20 c.c., is rendered alkaline with ammonia and extracted repeatedly with a chloroform-alcohol mixture (2 : 1); the united extracts are evaporated, and the residue of morphine titrated.—W. P. S.

Nicotine; The physical constants of —. I. Specific rotatory power of nicotine in aqueous solution. H. Jephcott. Chem. Soc. Trans., 1919, 118, 104–108.

THE specific gravity and specific rotatory power of pure nicotine have been determined. Nicotine purified through the nitroso compound showed sp. gr. 1.00920 at 20°/4° C.; $[\alpha]_D^{20} = 168.52$, and another preparation, purified through the double zinc chloride compound, showed: sp. gr. 1.00925 at 20°/4° C.; $[\alpha]_D^{20} = 168.61$. The same constants have been determined for aqueous solutions of nicotine over the entire range. The sp. gr. at 20°/4° C. has a maximum value of 1.03990 at a concentration of 71.963 grms. per 100 c.c., or 69.202% by weight. The specific rotatory power falls rapidly at first on

dilution and then more gradually, reaching a minimum value of 79.25 at a concentration of 6.622 grms. per 100 c.c. The curve, however, is not a continuous sweep downwards, but shows a series of small rises at intervals corresponding to hydrates in molecular proportions. The sp. gr. of pure nicotine has been determined at various temperatures from 20° (1.00925) to 97.7° C. (0.94534). The specific rotatory power rises slightly with increase of temperature to 169.71 at 92° C. Owing to the so-called closed curve of solubility of nicotine in water, the constants cannot be determined for solutions containing between 7 and 87% of nicotine at all temperatures, because separation occurs at about 60° C. For concentrations just outside these limits, values have been determined at 20° and 90° C., which show a strong increase of specific rotatory power at the higher temperature. The peculiar behaviour of mixtures of nicotine and water is explained by the fact that nicotine is only sparingly soluble in water, and water is only sparingly soluble in nicotine, but the hydrates of nicotine are miscible with either, a state of balance existing between nicotine, its hydrates, and water.

—J. F. B.

Phenacetin and other p-aminophenol derivatives. Determination of — by hypochlorous acid.
A. D. Powell. Analyst, 1919, 44, 22–25.

In acid solution, *p*-aminophenol and *p*-phenetidine react with sodium hypochlorite, quinonechlorimine being formed: $\text{HO.C}_6\text{H}_4.\text{NH}_2.\text{HCl} + 4\text{Cl} = 4\text{HCl} + \text{O} : \text{C}_6\text{H}_3.\text{NCl}$. Owing to the difficulty of determining when an excess of chlorine has been added, direct absorption does not form a suitable base for calculating the result; however, when the quinonechlorimine is treated with hydriodic acid, the reverse reaction takes place, four atoms of iodine being liberated and *p*-aminophenol re-formed. The *p*-aminophenol or *p*-phenetidine is dissolved in 100 c.c. of water and 5 c.c. of concentrated hydrochloric acid and 10 c.c. of sodium hypochlorite solution (about 0.8*N*) are added; air is then blown through the mixture for 15 mins., to remove excess of chlorine, potassium iodide solution is added, and, after 5 mins., the iodine is titrated with *N*/10 thiosulphate solution. Each c.c. of the latter is equivalent to 0.00273 gm. of *p*-aminophenol or 0.00343 gm. of *p*-phenetidine; the result obtained is multiplied by 1.015 to correct for loss during aeration. In the case of phenacetin, the substance is boiled for 1 hr. with hydrochloric acid (phenacetin, 1 gm., concentrated hydrochloric acid, 25 c.c., and water, 15 c.c.) before the above process is applied. One c.c. of *N*/10 thiosulphate solution is equivalent to 0.00448 gm. of phenacetin. The presence of caffeine does not interfere with the determination of phenacetin, but if salol is present salicylic acid and phenol must be removed after the hydrolysis; the method cannot be used for mixtures of phenacetin and acetanilide, unless the latter is separated previously, but may be applied to the determination of lactophenin (lactyl-*p*-phenetidine), salophen (salicylic ester of acetyl-*p*-aminophenol), and certain photographic developers such as metol (methyl-*p*-aminophenol sulphate). In the case of metol, the presence of the methyl group prevents chlorination of the amino group, although a quinone derivative is formed; the latter liberates two atoms of iodine per molecule instead of four, as in the case of quinonechlorimine.—W. P. S.

Ether in ethyl alcohol; Determination of small quantities of ethyl —. H. E. Cox. Analyst, 1919, 44, 26–27.

Alcohol of 99% and upwards, distils over unchanged under ordinary conditions; any ether pre-

sent passes over in the first fractions, and no constant boiling mixture is formed. It is, therefore, possible to determine the amount of ether by taking the sp. gr. before and after distillation. The sp. gr. of the alcohol is assumed to be that found after the removal of the ether. Each 1% of ether lowers the sp. gr. of alcohol by 0.0007, and the quantity of ether present is indicated by the expression: sp. gr. of alcohol—sp. gr. of mixture

0.0007

given showing the effect of ether on the sp. gr. of alcohol.—W. P. S.

Essential oil and wax of shuei flowers (Jasminum odoratissimum, L.). R. Tsuchihashi and S. Tasaki. Kōgyō-Kwagaku-Zasshi (J. Chem. Ind., Tokyo), 1918, 21, 1117–1143.

The fresh flowers of shuei (*Jasminum odoratissimum, L.*) which is cultivated in Formosa and used for perfuming tea, yielded on extraction with petroleum spirit 0.277% of "concrete essence," which was separated by maceration with alcohol into 0.116% of essential oil and 0.166% of "flower wax." The enfleurage process of extracting the essential oil was unsuccessful. The oil was a reddish-brown liquid with the following characters:—Sp. gr. at 15° C., 0.9309; $n_D^{15} = 1.4845$; n_D^{15} (100 mm.) = +5.64; acid value, 5.85; saponif. value, 92.25; and saponif. value after acetylation, 186.20. By fractional distillation the oil was separated into a series of fractions boiling at 66° to 200° C., in which the following constituents were identified:—*d*-Linalool, 6%; *d*-linalyl acetate, 6%; benzyl alcohol, 1.6%; benzyl acetate, 6%; indole and methyl anthranilate, 10%. In the higher fractions a substance which was probably a sesquiterpene alcohol or diterpene alcohol was separated. It constituted the main portion (57%) of the oil. Hesse's "jasmon" was not found in any fraction, and the characters of the oil were different from those of *Jasminum grandiflorum, L.*, studied by Hesse and Müller (this J., 1901, 275, 1137). The flower wax had the following characters:—Sp. gr. at 100°/15° C., 0.8259; m.pt., 45°–47° C.; $n_D^{40} = 1.4622$; $[\alpha]_D^{15} = 0.11$; acid value, 1.25; saponif. value, 67.53; unsaponif. matter, 67.07%; iodine value (Hübl), 100; and Reichert-Meissl value, 1.0. The unsaponifiable matter consisted mainly of triacontane, $\text{C}_{30}\text{H}_{62}$.—C. A. M.

PATENTS.

Diolfines; Process of making —. G. Mersereau, New York, Assignor to Chemical Development Co. U.S. Pat. 1,282,906, 29.10.18. Appl., 30.9.12.

Vapours of a petroleum oil are maintained in contact with a surface heated to a gas-making temperature (about 700° C.) for a time insufficient to convert all of the vapours into gas but until the proportion of diolfines in the gas has become substantial and ceases to increase rapidly. The gas is then removed from contact with the heated solid surface, cooled to remove oil vapours, and the diolfines are subsequently removed from the gas, the residue being re-heated to produce more diolfines.—J. F. B.

Hydantoin; Process for the production of new derivatives of —. L. Hermanns, Heidelberg, Assignor to Farb. vorm. Meister, Lucius, und Brüning, Höchst, Germany. U.S. Pat. 1,285,703, 26.11.18. Appl., 14.2.16.

See Eng. Pat. 105,719 of 1916; this J., 1917, 615.

Hydrogenating. U.S. Pat. 1,285,960. See XII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Yellow dye; New — and [photographic] light filters made from it. C. E. K. Mees and H. T. Clarke. Communication No. 75 from Eastman Kodak Res. Lab. Brit. J. Phot., 1919, 66, 48.

THE dye most commonly used, before the war, for the preparation of yellow light-filters for use with colour-sensitised plates was the German Filter Yellow K, introduced in 1907. A satisfactory substitute for this has been found in the group of phenylglucosazones, the best compound being the sodium salt of glucosephenylsazone-*p*-carboxylic acid. This is prepared from *p*-nitrotoluene by successive oxidation, reduction, diazotising, and formation of the glucosazone of the resulting acid. The acid is insoluble in water and almost insoluble in alcohol, but the sodium salt is very soluble in water and gives light-filters which are very stable to light, though not quite so stable as those prepared with Filter Yellow, have a sharper cut in the light blue than Filter Yellow, and nearly as strong an absorption in the ultra-violet. Absorption curves are given for filters of various strengths of the new dye, Eastman Yellow, compared with Filter Yellow and Tartrazine.—B. V. S.

Moisture; Action of — on the sensitiveness of photographic plates. E. Cousin. Bull. Soc. Franc. Phot., 1918, 6, 27—28.

EXPERIMENTS are described to demonstrate the reduction of sensitiveness of a photographic plate by moistening the film. For example if a plate be placed in contact for some time with a piece of damp paper, on which a design is printed in greasy ink, impervious to moisture, a positive of the design is obtained on slightly exposing and developing the plate.—B. V. S.

[Photographic] reducing bath of acid potassium bichromate. E. Cousin. Bull. Soc. Franc. Phot., 1918, 6, 26—27.

IN consequence of the high price of potassium ferricyanide a reducing solution is recommended containing one part of potassium bichromate and 20 parts of sodium bisulphate per 1000 parts of water. If too low a proportion of bisulphate is used an intensifying effect is produced by the formation of silver chromate.—B. V. S.

Phenacetin, etc. [metol]. Powell. See XX.

PATENTS.

Coloured photographic views; Method of producing —. H. Pedersen, Copenhagen. Eng. Pat. 121,776, 15.12.17. (Appl. 18,648/17.)

A TRANSPARENT base is provided with a multicolour screen, the colours of which are insoluble in water but soluble, for example, in alcohol, and to this is applied a light-sensitive film containing also a white pigment. After exposure through the colour screen and development, the silver image is bleached in a bath which at the same time hardens the gelatin film proportionally to the depth of the image, the bleached image is fixed out, and the soluble parts of the gelatin film are then removed by treatment with hot water. After drying the film is pressed into contact with a colourless gelatin film moistened with alcohol, the colours of the screen being then transferred to the two upper films in proportion to the quantity of the lower film which is left at any part. When the transfer of the colours is complete the upper film is removed, and the lower film dried and transferred by a double transfer process to a black paper support.

—B. V. S.

Photo-engraving. C. P. Browning, New York. U.S. Pat. 1,285,015, 19.11.18. Appl., 8.6.15.

A METALLIC plate is provided with two sensitive films, the lower one being much less sensitive than the upper one and separated from it by a transparent protective coating. A negative is formed on the upper film, the lower film exposed through it, the negative and protective coating removed, and the positive developed. The lower film forms the resist in etching the metal support.—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

Trinitrotoluene residues and their utilisation [for explosives and sulphur dyes]. M. Copisarow. Chem. News, 1919, 118, 13—14.

THE recovery of trinitrotoluene residues from the used nitration acids is usually effected by diluting the acids with water so as to precipitate the nitro compounds. This process if carried beyond a certain point has the drawback of requiring the concentration of large volumes of dilute acid to recover the acid. A better method is to dilute the acid sufficiently to precipitate the bulk of the nitro compounds and then to extract the acid with toluene, so as to obtain a still fairly concentrated acid, and a toluene extract, which can be nitrated (cf. Leitch, Eng. Pat. 15,455 of 1915; this J., 1916, 869). For the purification of crude T.N.T. by means of alcohol, the latter is used either as a solvent and crystallising agent or as a washing medium. In either case the residual alcohol when evaporated leaves a dark brown thick liquid, sparingly soluble in water, forming a yellowish solution, which on treatment with sodium hydroxide gives a red coloration characteristic of α -trinitrotoluene and other nitro compounds accompanying it. Analysis of a sample of the residue gave the following results:—Sp. gr. at 20° C., 1.47 and 1.50; volatile matter (alcohol, water, etc.), 0.77 and 0.81%; substances insoluble in benzene (oxidation and condensation products of polynitrotoluenes and inorganic substances), 1.35 and 1.40%; and nitrogen in purified residue, 15.95 and 16.01%. The proportion of nitrogen showed that the purified residue consisted of 80.32 to 82.26% of dinitrotoluenes and 17.74 to 19.68% of trinitrotoluenes. On standing for a long time at the ordinary temperature the residue gradually crystallises into a semi-solid mass, which can be separated by means of a filter-press or centrifuge into:—(a) a brown solid containing 1.45 to 1.55% of substances insoluble in benzene; and (b) a liquid resembling the original residue. The proportion of solid matter varies with the conditions of the alcoholic treatment, and duration and range of cooling, but is seldom less than 18%. By nitrating the crude residue at 100°—120° C. with a mixture of nitric and sulphuric acids containing 6% of water and 15 to 17% of nitric acid, a light yellow opaque liquid (sp. gr. 1.49 to 1.51 at 20° C.) is obtained. It contains 16.94 to 17.4% N, corresponding to 48.4 to 64.5% of trinitrotoluenes, and forms a gelatinous mass with gun-cotton. It may thus be regarded as a "liquid T.N.T." suitable for the preparation of gelatinous dynamite and compares favourably with Nobel's explosive (Ger. Pats. 24,235, 264,503). Nitration of a residue previously freed from volatile substances and substances insoluble in benzene yields practically the same product, though it effects a certain economy in acid. By nitrating the products thus obtained from the residue or the original residue itself with a mixed acid containing 4% of water and 17% of nitric acid at 120° C. a slightly yellowish solid resembling crude trinitrotoluene of good quality is obtained. This solidifies at 57°—58° C.,

whilst the amount of nitrogen (18.44%) indicates that it contains at least 98% of trinitrotoluenes. It appears to be a mixture of isomeric trinitrotoluenes or additive compounds thereof, and may be conveniently termed "iso-trotyl." It could be used as a constituent of blasting powders, such as bellite and roborite, or for war explosives, especially when a lowering of the m.pt. is required, as in the case of trinitroxylenes. The method of dissolving the residue in toluene and nitrating the filtered solution in two or three stages is unsatisfactory, since a portion of the nitrated product is the liquid compound described above. This is probably due to the fact that the dinitrotoluenes derived from *m*-mononitrotoluene are not nitrated so readily as those derived from the *o*- and *p*-modifications, and also to the gradual reduction in the strength of the mixed acid. The facts support the conclusion that the solid compound represents a higher stage of nitration than the liquid, but that both ultimately yield, on complete nitration, a mixture of isomeric trinitrotoluenes. The most economical method of preparing "liquid T.N.T." and "isotrotyl" in one operation is to cool the crude residue, separate the solid, which is then nitrated to "isotrotyl," whilst the filtrate is nitrated to "liquid T.N.T." By an adaptation of Hofmann's method of preparing chloropicrin, $\text{CCl}_3(\text{NO}_2)$, (Annalen, 1866, 139, 111), it is possible to prepare that compound by treating T.N.T. residues with bleaching powder, the yield, allowing for the proportion of nitrogen, being as satisfactory as that obtained from picric acid residues. By fusing T.N.T. residues or their nitration products with sodium sulphide, with or without the addition of sulphur, dyestuffs are obtained which dye unmordanted cotton colours varying from grey to khaki and brown. The particular shade depends upon the concentration of the dye-bath, the temperature and duration of the fusion, and whether sulphur is or is not used in making the dyestuff.—C. A. M.

Glyceryl methyl ether dinitrate (α-methyl dinitrate). D. T. Jones. Chem. Soc. Trans., 1919, 119, 76–81.

The dinitrate was prepared by the nitration of glyceryl α-monomethyl ether by a mixture of nitric and sulphuric acids between 15° and 20° C. The product was completely soluble in the nitrating acid and mostly precipitated by dilution; the portion soluble in the dilute acid was extracted by ether after neutralisation, the total yield being 77% of the theoretical quantity. The pure dinitrate crystallised with difficulty; the crystals melted at 24° C. It distilled at 124° C. under 18 mm. pressure. Evaporation tests showed a rate of volatilisation at 100° C. 7–8 times as fast as that of nitroglycerin. The liquid has sp. gr. 1.374 at 15°/15° C., and $n_D^{20}=1.4478$. It is soluble in many organic solvents but not in carbon bisulphide or light petroleum. It gelatinises nitrocellulose rapidly in the cold and after warming yields a gelatin softer and more plastic than that made with nitroglycerin. Comparative tests with dynamites made with the methyl ether dinitrate and ordinary nitroglycerin showed that the ballistic power of the dinitrate-dynamite was slightly more than two-thirds of that of nitroglycerin, and it was far less sensitive to shock. On heating, the methyl ether dinitrate exploded at 182°, as compared with 192° C. for trinitroglycerin. Determinations of the molecular freezing point depression constant for nitroglycerin in admixture with the dinitrate showed values from 72.4 to 81.0, not very greatly different from those obtained with ethyl nitrate and monochlorohydrin dinitrate. Attempts to obtain a labile form of the dinitrate analogous to that of nitroglycerin gave no result.—J. F. B.

XXIII.—ANALYSIS.

Electro-titrimetric analyses; Effect of dilution in — G. A. Frenk. Chem. Soc. Trans., 1919, 119, 55–61.

With a view to the possible application of electro-titrimetric methods to the analysis of potable waters, the author has determined the lower limits of concentration at which the method can be used. The conditions of experiment employed were kept as simple as possible, no special precautions being taken to maintain a constant temperature during the titration, which usually occupied 15–20 minutes; burettes capable of being read to 0.01 c.c. were used. In the estimation of sulphates by the addition of *N*/25 barium chloride the results were accurate only down to a concentration of 200 mgrms. SO_4 per litre. In more dilute solutions no definite end point, as indicated by a sharp break in the conductivity curve, was observed. When barium sulphate was added before titration, in order to saturate the liquid with the precipitated product, good results were obtained down to a concentration of 50 mgrms. SO_4 per litre. This appeared to be the limit for a definite end point, but results within about 5% of the truth could be obtained with a solution containing 25 mgrms. SO_4 per litre by extending the two straight limbs of the curve to a point of intersection. In the estimation of chlorides by *N*/25 silver nitrate definite end points were obtained down to 10 mgrms. Cl per litre; the addition of precipitated silver chloride did not render the end point sharp at lower concentrations. In the titration of calcium chloride by *N*/10 ammonium oxalate, the limit for sharp results was 200 mgrms. Ca per litre. The same limit was obtained in the titration of magnesium sulphate by *N*/10 sodium hydroxide. In neither of these cases did the addition of some of the precipitated substance improve the results at lower concentrations.—J. F. B.

Barium; Volumetric determination of — T. Steel. Analyst, 1919, 44, 29.

In the determination of barium as chromate according to the method described by Waddell (this J., 1918, 561 s), the author recommends the use of water saturated with barium chromate for washing the precipitate before the latter is dissolved and titrated.—W. P. S.

Copper; Determination of — by means of potassium thiocyanate, potassium iodide, and thiosulphate. I. M. Kolthoff. Chem.-Zeit., 1918, 42, 609–610.

The method, originally proposed by Bruhns (this J., 1918, 751 A), is criticised and modified; when carried out as follows it is reliable:—The copper solution is treated with 10 c.c. of 0.2% potassium iodide solution, 5 c.c. of 4*N* sulphuric acid, and 10 c.c. of 10% potassium thiocyanate solution, and then titrated with *N*/10 thiosulphate solution. The acid must be added before the thiocyanate. The reaction may be used for the determination of excess of copper in sugar determinations; in this case, the cuprous oxide need not be separated but it is essential that the acid and thiocyanate be added immediately one after the other to prevent oxidation of the cuprous oxide. Copper may be determined in the presence of ferric salts provided that the mixture is first treated with sodium pyrophosphate solution.—W. P. S.

Alkali carbonates in presence of free alkali, and flue gases. Dubrisay and others. See VII.

Spent oxide. Colman and Yeoman. See VII.

Ferric oxide in silicates. Hackl. See VII.

Rational analysis of clays. Washington. See VIII.

Aluminium alloys. Travers. See X.

Arsenic in ferromolybdenum. Binder. See X.

Fatty acids in kaolin and alumina soaps. Alpers. See XII.

Salt content of soils. Bouyoucos and McCool. See XVI.

"Chlorine index" of soils. Lapicque and Barbé. See XVI.

Wine analysis. Schulte. See XVIII.

Glycerol in wines. Canónica. See XVIII.

Cacao shell. Knapp and McLellan. See XIXa.

Silica and sand [in feeding stuffs]. (1) Lloyd. (2) Dyer. See XIXa.

Morphine in opium, etc. Tingle. See XX.

Phenacetin, etc. Powell. See XX.

Ether in alcohol. Cox. See XX.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

- Ablett. Subjecting material to chemical treatment and grinding and/or mixing etc. 2004. Jan. 27.
 Dick. Evaporating apparatus. 3046. Feb. 7.
 Green and Lewis. Distilling or recovering volatile inflammable liquid solvents. 2482. Jan. 31.
 Gregson and King. Gas-heated furnaces. 2543. Feb. 1.
 Imray (Jefferies and Norton). Cooling and liquefying gaseous fluids. 2580. Jan. 30.
 Kirby and Lakin. Grinding and pulverising materials. 2213. Jan. 29.
 Krüger. Apparatus for drying granular etc. substances. 2858. Feb. 5.
 Levy. Collection and recovery of volatile solvents evaporated into the atmosphere. 1940. Jan. 27.
 Mann. Decomposition of substances in liquid and/or vapour phases. 2905. Feb. 6.
 Read (Read Machinery Co.). Mixing and agitating machines etc. 2759. Feb. 4.
 Rigby, and Rigby and Mellor. Drying cylinders. 2041. Jan. 28.
 Sonsthagen. Machine for mixing liquid, semi-liquid, or viscid materials. 3117. Feb. 8.
 Swinburne. 2208 and 2210. See II.
 Wetter (Weinrich). Manufacture of carbonaceous material for filtering media etc. 2437. Jan. 31.

Weyman. 1955. See X.

COMPLETE SPECIFICATIONS ACCEPTED.

- 19,116 (1917). Kitson. Furnaces. (122,672.) Feb. 12.
 19,189 and 19,190 (1917). Davis and Twigg. Regenerative gas-fired furnaces. (122,673 and 122,674.) Feb. 12.
 1369 (1918). Anderson. Installation for use in the extraction of mineral, animal, and vegetable substances. (122,477.) Feb. 5.
 1500 (1918). Lloyd and Wild. Recovery of solvents and volatile liquids. (122,685.) Feb. 12.
 1822 (1918). Reavell, and Kestner Evaporator and Engineering Co. Apparatus for concentrating, distilling, and/or elevating liquids. (122,500.) Feb. 5.
 1925 (1918). Smallwood. Furnaces. (122,504.) Feb. 5.
 2171 (1918). Hutchins. Apparatus for facilitating the obtaining of crystals from solutions. (122,507.) Feb. 5.
 2594 (1918). Mouneyrat. Chambers for effecting manipulations out of contact with the air, or in any desired atmosphere. (122,515.) Feb. 5.
 2677 (1918). Leitch and Warburton. Apparatus for heating or cooling liquid or semi-liquid materials on a revolving cylinder. (122,721.) Feb. 12.
 3842 (1918). Huntington, Heberlein and Co., and Bingham. See XI.
 5027 (1918). Francart. Kilns, furnaces, ovens, etc. (122,742.) Feb. 12.
 17,493 (1918). Fletcher. Conversion of water pastes into oil pastes by chemical and mechanical action. (122,612.) Feb. 5.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Acland, Garrow, and Nielsen. Carbonisation and destructive distillation of carbonaceous materials. 2240. Jan. 29.
 Bartolomeis and La Porta. Distillation of asphalt rock, bituminous slate, etc. 2661. Feb. 3.
 Bennett, Gillott, and Marple. Producer-gas generators. 2829. Feb. 5.
 Boughton and Hack. Apparatus for washing gas. 2825. Feb. 5.
 Bradley and Graham. Artificial fuel. 3107. Feb. 8.
 Byrom. Desulphurising oils. 2588, 2579. Jan. 30 and Feb. 1.
 Carpenter. Operation of horizontal carbonising retorts. 1983. Jan. 27.
 Edwards. 2073. See III.
 Everett and Salegni. Treatment of carbonaceous materials for manufacture of power gas with recovery of hydrocarbon oils. 2864. Feb. 5.
 Gregson and King. 2543. See I.
 Heeley. Coke-quenching devices. 2013. Jan. 27.
 Hills. Manufacture of fuel briquettes. 2444. Jan. 31.
 Hills and Wheeler. Manufacture of briquettes. 2566. Feb. 1.
 Holt and Walker. Manufacture of gas from coal etc. 2706. Feb. 4.
 Humphreys. Gas-generating apparatus. 2592. Feb. 1.
 Hurez. Coke-ovens. 2974. Feb. 6. (Fr., 261,18.)
 King. Fuel for internal-combustion engines. 2256, 2257. Jan. 29.
 Kneen and Murray. Means for decomposing steam and using the products for heating. 2223. Jan. 29.
 McHarry. Gas-producers etc. 2036. Jan. 28.

Pearse (Kennedy). Rotary retorts, and destructive distillation of carbonaceous material therein. 2249. Jan. 29.

Renkin. Apparatus for burning pulverised fuel. 2308. Jan. 30. (U.S., 31.1.18.)

Stein et Cie. Coal-distillation furnaces. 3128. Feb. 8. (Fr., 22.2.18.)

Swinburne. Low-temperature destructive distillation. 2208. Jan. 29.

Swinburne. Distillation of fragile fluids. 2210. Jan. 29.

Waring and Waring. 2997. *See* X.

Wetter (Weinrich). 2437. *See* I.

Weyman. 1955. *See* X.

COMPLETE SPECIFICATIONS ACCEPTED.

1170 (1918). Russell. Coal-washing. (122,454.) Feb. 5.

1276 (1918). Penrose and Penrose. Manufacture of vegetable charcoal. (122,465.) Feb. 5.

1337 (1918). British Oxygen Co., and others. *See* VII.

1746 (1918). Hiller. Apparatus for low-temperature distillation of coal and other bituminous substances. (122,496.) Feb. 5.

1779 and 7415 (1918). Leadbeater. Obtaining carbon from peat for decolorising purposes. (122,698.) Feb. 12.

1815 (1918). West and Glover. Destructive distillation of coal and like carbonaceous materials. (122,700.) Feb. 12.

7528 (1918). Lamberty. Manufacture of briquettes. (119,443.) Feb. 5.

10,767 (1918). South Metropolitan Gas Co., and Somerville. Removal of carbon monoxide. (122,781.) Feb. 12.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

Cobellis. Manufacture of synthetic carboic acid. 2946. Feb. 6.

Edwards. Fractional distillation plant for coal tar, hydrocarbons, etc. 2073. Jan. 28.

IV.—COLOURING MATTERS AND DYES.

APPLICATION.

Brotherton and Co., Mersey Chemical Works, Ehrhardt, and Ehrhardt. Manufacture of colouring matters dyeing by the metachrome process. 3122. Feb. 8.

COMPLETE SPECIFICATION ACCEPTED.

4289 (1918). Morris. *See* XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

Goussedet. Process for production of derivatives of cellulose. 2911. Feb. 6.

Papelera Espanola. Manufacture of paper. 2939. Feb. 6. (Spain, 8.2.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

830 (1918). Marks (Du Pont de Nemours and Co.). Production of coated fabrics. (122,677.) Feb. 12.

1180 (1918). Marks (Du Pont de Nemours and Co.). Methods of producing pyroxylin-coated fabrics. (122,680.) Feb. 12.

1182 (1918). Marks (Du Pont de Nemours and Co.). Production of pyroxylin-coated fabrics. (122,681.) Feb. 12.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Brotherton and Co., Merriman, and Mersey Chemical Works. Production of blue-black to black shades on wool by the metachrome process. 3123. Feb. 8.

Moser. Treatment of woven and other fabrics for decorative etc. purposes. 2733. Feb. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

2053 (1918). Dudley. Dyeing-machine. (113,440.) Feb. 12.

11,427 (1918). Ainsworth and Mather. Machines for winding and dyeing yarns, threads, or similar materials. (122,786.) Feb. 12.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Evans, Honnings, and South Metropolitan Gas Co. Manufacture of ammonium sulphate. 2379. Jan. 30.

Higgins, and United Alkali Co. Manufacture of caustic potash. 2942. Feb. 6.

Norsk Hydro-Elektrisk Kvaestofaktieselskab. Production of pure concentrated nitric acid and tetroxide of nitrogen. 2729. Feb. 4. (Norway, 13.3.18.)

Serret. Production of acetic acid. 3086. Feb. 7.

Tyrer. Process for manufacturing alumina from blast-furnace slag. 2755. Feb. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

15,608 (1917). Hayhurst. Vessels for containing acids and other liquids. (122,661.) Feb. 12.

17,413 (1917). Standard Oil Co. Art of producing aluminium carbide. (112,929.) Feb. 12.

1337 (1918). British Oxygen Co., Bray, and Balfour. Treatment of spathic iron ore for use in the manufacture of hydrogen. (122,474.) Feb. 5.

6525 (1918). Ridoni, and Soc. Talco e Grafiti Vai Chisone. Process and apparatus for the manufacture of hydrofluoric acid. (115,425.) Feb. 12.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Doyle. Treatment of clay etc. 2757. Feb. 5.

Forster. Machinery for manufacture of sheet glass. 2017. Jan. 28.

Newton. Tap for filter presses for filtering potters' slip. 2445. Jan. 31.

Quimby and Robinson. Apparatus for building up an object of quartz glass. 2866. Feb. 5.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Arend. Manufacture of alloys of copper, zinc, and lead. 2495. Jan. 31.

Arend. Process for making alloys rich in lead. 2496. Jan. 31.

Ballantine. Manufacture of alloys. 2921. Feb. 6.

Boisselier. Solder for aluminium. 2288. Jan. 30. (Fr., 26.3.18.)

Bolton. 2134. *See* XI.

Brearley and Johnson. 3171. *See* XXIII.

Brighten and Peakman. Furnaces for heat-treatment of metals. 2737. Feb. 4.

Coles. Process for building up or growing iron upon steel etc. surfaces. 2601. Feb. 3.

Coles. Electrolyte for deposition of iron. 2602. Feb. 3.

Dixon. Melting iron and steel. 2740. Feb. 4.

Hall. Metal-melting furnaces. 2851. Feb. 5.

Howe. Metallurgical furnaces. 2493. Jan. 31.

Ingle. Preparation for removing rust from, and preventing formation of rust upon, iron. 2033. Jan. 28.

Kievits, and Kynoch, Ltd. Pyrometer for measuring temperatures of molten non-ferrous metals. 2331. Jan. 30.

Sulman. Manufacture of alloys. 2921. Feb. 6.

Tyrer. 2755. *See* VII.

Waring and Waring. Gas-producing and steam-raising combined with steel-melting furnaces etc. 2997. Feb. 7.

Weyman. Apparatus for separation of dust from blast-furnace etc. gases. 1955. Jan. 27.
White (Byers Co.). Puddling iron. 3066. Feb. 7.

Wood and Wood. Cupolas. 2705. Feb. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

1603 (1918). Armstrong. Metallurgy of zinc. (122,688.) Feb. 12.
5179 (1918). Critchley, Sharp, and Tetlow, and Hepworth. Hardening and tempering of wire. (122,743.) Feb. 12.
21,520 (1918). Rogers, Lancaster, Walter, and Jackson. Treatment of tinned scrap. (122,618.) Feb. 5.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Bolton. Electric heating-element for raising temperature of solution in electro-plating vats. 2184. Jan. 29.
Coles. 2602. *See X.*
Cooke. Storage batteries for electricity. 3024. Feb. 7.
Exley and Leitner. Charging-boards for electric accumulators. 2194. Jan. 29.
Exley and Leitner. Manufacture of electric accumulators. 2507. Jan. 31.
Fuller Accumulator Co., and Jones. Electric storage batteries or accumulators. 2916. Feb. 6.
Hossack. Dry batteries. 2203. Jan. 29.

COMPLETE SPECIFICATIONS ACCEPTED.

1765 (1918). Robin. Electrodes of electric batteries. (122,697.) Feb. 12.
3842 (1918). Huntington, Heberlein, and Co., and Bingham. Apparatus for the electrical separation of suspended particles from gaseous bodies. (122,534.) Feb. 5.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Dacey. Apparatus for eliminating free fatty acids etc. from crude oils. 2632. Jan. 28.
Dixon and Harvey. Hydrogenation. 2727. Feb. 4.
Dunham. Emulsifiable oil material in dry form, and process of making same. 2362. Jan. 30.

COMPLETE SPECIFICATIONS ACCEPTED.

1750 and 10,424 (1918). Witter. *See XIII.*
2388 (1918). Co-operative Wholesale Society, Martin, and Brizell. Process for deodorising and decolorising cocoa butter. (122,512.) Feb. 5.
8209 (1918). Pink. Separating solid and liquid fatty or fat-like bodies. (122,764.) Feb. 12.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

1872 (1918). Bailey. Manufacture of anti-fouling paints. (122,683.) Feb. 12.
1750 and 10,424 (1918). Witter. Process for treating linseed oil residual fatty acids and utilising the same as oil for paint or for oxidation for the manufacture of linoleum or like products. (122,696.) Feb. 12.
4289 (1918). Morris. Manufacture of lakes. (122,540.) Feb. 5.
17,493 (1918). Fletcher. *See I.*

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATION.

Shaw. Washing crude rubber etc. containing grt. 2072. Jan. 28.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATION.

Kent. Process for regeneration of leather from leather scraps or waste. 3018. Feb. 7.

COMPLETE SPECIFICATIONS ACCEPTED.

1178 (1918). Marks (Du Pont de Nemours and Co.). Process for producing artificial leather. (122,678.) Feb. 12.
1179 (1918). Marks (Du Pont de Nemours and Co.). Methods of producing artificial leather. (122,679.) Feb. 12.
19,236 (1918). Peyrache and Bailly. Method of preparing bates for hides. (120,928.) Feb. 5.
19,897 (1918). Channon. Liquid glue. (122,807.) Feb. 12.

XVI.—SOILS; FERTILISERS.

COMPLETE SPECIFICATION ACCEPTED.

2083 and 12,160 (1918). Conder. Apparatus for use in excavating superphosphates and the like. (122,709.) Feb. 12.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Beeton, and Trufood, Ltd. Drying organic substances. 2655. Feb. 3.
Falk and Frankel. Preserving food. 2382. Jan. 30. (U.S., 30,118.)
Scorer. Refuse destructors. 2906. Feb. 7.
Selden Co., and Selden. Process of purification. 2657. Feb. 3.
Wilson. Apparatus for treatment of sewage. 2675. Feb. 3.

COMPLETE SPECIFICATIONS ACCEPTED.

12,136 (1917). Jones, and Jones and Attwood. Purification of sewage and other liquids. (122,428.) Feb. 5.
2388 (1918). Co-operative Wholesale Society and others. *See XII.*

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Dixon and Harvey. 2727. *See XII.*
Leach, and United Alkali Co. Manufacture of benzoic acid. 2943. Feb. 6.
Mitsui Kozan Kabushiki Kaisha. Process for decomposing paranitracetanilide. 2951. Feb. 6. (Japan, 16,518.)

COMPLETE SPECIFICATIONS ACCEPTED.

15,755 (1917). Soc. Chim. des Usines du Rhône, anc. Gilliard, Monnet, et Cartier. Manufacture of ethylidene diacetate. (112,765.) Feb. 12.
6292 (1918). Abbott Laboratories. β -Bromo-ethyl *p*-nitrobenzoate. (121,578.) Feb. 12.
10,180 (1918). Napp (Hoffmann, La Roche and Co.). Process for the manufacture of easily-soluble compounds of the CC-dialkyl-, CC-diallyl-, and CC-alkyl-aryl-barbituric acids. (122,778.) Feb. 12.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATIONS.

Bradshaw. Colour photography. 3081. Feb. 7.
Thornton. Kinematograph films and manufacture thereof. 2027. Jan. 28.
Thornton. Kinematograph colour films. 2028. Jan. 28.

XXII.—EXPLOSIVES; MATCHES.

APPLICATION.

Clark. Matches. 2918. Feb. 6.

COMPLETE SPECIFICATION ACCEPTED.

13,263, 16,276, and 18,115 (1916). Sumner. Apparatus for filling explosive material into shells or other receptacles. (122,425.) Feb. 5.

XXIII.—ANALYSIS.

APPLICATION.

Brearley and Johnson. Apparatus for testing the hardness of materials. 3171. Feb. 8.

I.—GENERAL; PLANT; MACHINERY.

Volatile inflammable solvents; Recovery of — in industrial operations. Q. Sestini. *Annali Chim. Appl.*, 1918, 10, 117—130.

A METHOD devised for the recovery of the solvent used in impregnating gauze dressings with iodoform is also applicable in other directions. The gauze is delivered from rollers into a closed chamber divided into three compartments. In the first of these it is immersed in an ethereal solution of rosin and iodoform; in the second the solvent is evaporated; and in the third the dried gauze is wound on another roller. Electric heating is used for evaporating the ether, since it is necessary strictly to regulate the temperature to prevent loss of iodoform. Simple resistance coils are unsuitable for the purpose, owing to the ether being oxidised to acetaldehyde and formaldehyde in contact with the hot wires. To obviate this the resistance coil, to which a charge of 15, 10, or 5 kilowatts can be supplied at will, is immersed in hot oil in a rectangular box of iron plate, autogenously welded. A little below the surface of the oil is an iron tube which passes out through the side of the box and then extends downwards and upwards to form a U-tube. Near the base of the U-tube is a lateral tube for the injection of compressed air, and to this injector is conducted the air saturated with ether vapour within the apparatus. The emulsion of oil and air in the ascending arm of the U-tube rises to a level much higher than that of the oil in the electric resistance box, and passes to a small box provided with an outlet tube for the escape of air. The hot oil flows from the box downwards through a coil composed of four parallel tubes, over which passes the travelling band of gauze, and is led back into the resistance box. The ether evaporated from the gauze is withdrawn from the apparatus by means of a Leiman aspirator, and condensed in two spiral condensers, the first of which is cooled with water and the second with ice. From 50 to 80% of the ether is recovered, the average being about 70%.—C. A. M.

PATENTS.

Drying and like apparatus. T. W. S. Hutchins. Middlewich, Cheshire. Eng. Pat. 122,077, 13.3.18. (Appl. 4444/18.)

THE apparatus is particularly adapted for drying a paste containing carbon, as used in the preparation of carbon blocks for metallurgical or like purposes. The material is introduced into a horizontal rotating cylinder through a pipe at one end, and the evolved vapour and gas are withdrawn through a concentric pipe. The cylinder contains a number of loose short rollers. The charging end of the cylinder is at first slightly tilted up when the paste is charged into it, and the paste becomes spread over the internal surface during rotation, the rollers being at the lower end. After a predetermined charge is introduced, the temperature is raised to expel all liquid and leave the caked material on the walls of the cylinder. The inclination of the cylinder is then reversed so that the rollers work towards the other end and break up the deposit on the cylinder. The tilting of the cylinder may be repeated as often as necessary and then the cover at the end remote from the charging pipe is removed and the material discharged.—W. F. F.

Drying apparatus. S. S. Andursky, Rochester, N.Y. U.S. Pat. 1,286,195, 3.12.18. Appl., 4.5.18. The material to be dried is placed on the form-anous top of a casing containing a set of heat-

ing pipes and provided with an inlet for the drying air. The heater comprises a drum having branch pipes extending outwards and downwards from its opposite sides, with separate gas burners extending across the outer ends of the branch pipes, and having jets opening into the ends of the pipes. The outlet of the drum discharges outside the casing. Separate valves are provided for the burners, and a damper for the outlet is connected to the valves so as to be opened when either valve is opened.—W. F. F.

Desiccating apparatus. C. F. Coleman, Philadelphia, Pa. U.S. Pat. 1,286,558, 3.12.18. Appl., 6.3.17.

AN endless belt travels around two drums spaced apart vertically within a housing and dips into a liquid receptacle below the lower drum. Between the drums is a pair of vertical casings having inlet and outlet pipes and with their outer sides convex and bearing against the endless belt. Means are provided for tightening the belt so that it is held in frictional engagement with the casings.—J. H. P.

Dryer. E. B. A. Zwoyer, Perth Amboy, N.J. U.S. Pat. 1,290,009, 31.2.18. Appl., 16.2.17.

A HEATED chamber contains a rotary sectional platform with a second similar platform beneath the first but rotating in the opposite direction. Briquettes or other materials are placed in a thin layer on the upper platform and means are provided for their transference to the lower platform.—C. A. K.

Furnaces. A. F. Hinds, London, T. Stinchcombe, Chesterfield, and The Chemical Engineering and Wilton's Patent Furnace Co., Ltd., London. Eng. Pat. 122,232, 9.1.18. (Appl. 530/18.)

THE fuel is supported on perforated plates carried by perforated channel irons which may be reciprocated in any known manner. The chamber below the hearth is divided by transverse partitions into three compartments, and three air-supply pipes of the form described in Eng. Pat. 24,785 of 1904 (this J., 1905, 1293) extend from the front of the furnace into the three compartments respectively. Air is injected into the three pipes by steam nozzles projecting into the outer ends of the pipes, so that the air supply to each section of the grate may be regulated. The ash is discharged at the further end of the grate. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 9732 of 1894.)—W. F. F.

Furnace construction. W. S. Robinson, Benton Harbor, Mich. U.S. Pat. 1,286,114, 26.11.18. Appl., 26.2.17.

THE roof of a furnace is constructed as a hollow arch lined with firebrick, through which air for combustion is passed to the furnace. The outlet for the air extends longitudinally along the bottom of the arch, and means are provided to deflect the air at intervals through the outlet into the furnace.—W. F. F.

Furnace; Regenerative. —. T. F. Bailly and F. T. Cope, Assignors to The Electric Furnace Co., Alliance, Ohio. U.S. Pat. 1,286,907, 10.12.18. Appl., 25.1.18.

THE furnace comprises a heating chamber and a regenerative hood. Two trains of material move in parallel directions through the furnace, one

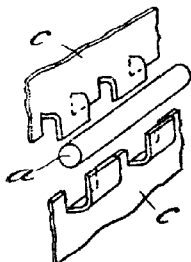
above the other, and means are provided for dropping material from the upper to the lower train.
—J. H. P.

Annealing furnace. T. F. Bally, Assignor to The Electric Furnace Co., Alliance, Ohio. U.S. Pat. 1,286,908, 10.12.18. Appl., 31.1.18.

THE furnace consists of a heating furnace and a regenerative hood. The heating furnace is located at the centre of the hood and receives heat from electrical resistance elements placed longitudinally in the sides of the furnace. Two parallel trains of material move in opposite directions through the regenerative hood and the furnace.—J. H. P.

Screening and filtering apparatus. F. W. Brackett and Co., Ltd., and F. W. Brackett, Colchester. Eng. Pat. 122,311, 4.3.18. (Appl. 3784/18.)

The edges of the plates, *c*, of an endless screen or filter are formed as shown in the figure, the



bent portions fitting over and the straight portions under cross-bars, *a*.—W. H. C.

Filter-film-forming apparatus. G. Moore, Joplin, Mo. U.S. Pat. 1,287,074, 10.12.18. Appl., 17.5.17.

A FILTER-FRAME is placed in a container mounted on pivots and the material which is to form the film is introduced into the container under pressure. When the film is formed the frame is removed.—W. H. C.

Filtering machine; Continuous automatic centrifugal — H. A. Herr, Philadelphia, Pa. U.S. Pat. 1,286,626, 3.12.18. Appl., 23.12.15.

THE material to be filtered is fed into a rotating basket provided with a central opening in the bottom which is normally closed by a cover. The solid material is deposited on the walls of the basket and the liquid is discharged. The speed of rotation of the basket is then reduced for a predetermined time, and the solid material removed from the walls by an oscillating scraper. The cover of the central opening is lifted off at a predetermined time, and the material which has collected on the bottom is swept through the opening by a conveyor.—W. F. F.

Gases; Apparatus for subjecting — to the action of heat and pressure. E. E. Somermeyer, Englewood, Fla. U.S. Pat. 1,286,135, 26.11.18. Appl., 26.4.17.

A REACTION chamber of refractory material is provided with an internal heating coil and is surrounded by a pressure chamber of metal. Gases to be treated are supplied to the reaction chamber and means are provided for putting the two chambers into communication and for maintaining the desired pressure in the pressure chamber. The products of the reaction are withdrawn from both chambers.—W. F. F.

Condenser. M. T. Brown and G. W. Southerland, Jacksonville, Fla. U.S. Pat. 1,286,523, 3.12.18. Appl., 29.6.15. Renewed 24.1.18.

A CONDENSER consists of an upper and a lower tank, the upper tank having a horizontal partition with pockets opening alternately in opposite directions. Certain of the pockets are provided with baffles for causing a tortuous passage of fluid through the tank. An outlet in the bottom of the upper tank opens into a pipe passing through the lower tank. The overflow from the upper tank supplies the lower tank.—J. H. J.

Cooler. F. A. Phillippi, Assignor to A. R. May and D. L. Evans, Pottstown, Pa. U.S. Pat. 1,286,704, 3.12.18. Appl., 24.11.15.

A PORCELAIN cylinder having a spiral projection formed on its outer surface is surrounded by an outer casing the inner surface of which is in contact with the spiral projection, thus forming a spiral channel through which liquid may flow.
—W. H. C.

Cooling-machine. A. McD. Gray, Elizabeth, N.J. U.S. Pat. 1,286,880, 3.12.18. Appl., 6.3.17.

UPRIGHT cooling vessels, each having a central rotating shaft provided with scrapers to detach the solids deposited on the interior surface of the vessels, are connected together at alternate ends by conduits within which means are provided to move the contents forward from vessel to vessel.
—W. H. C.

Cooling tower. C. V. Nordberg, Butte, Mont. U.S. Pat. 1,287,402, 10.12.18. Appl., 23.6.17.

THE floor of a natural draught cooling tower is inclined towards a well. Air inlets are arranged between the piers supporting the tower and between the tower and the piers. Stepped inclined girders are carried by the piers and support the floor. Annular series of concentric baffles are disposed in stepped and lapped relation above the floor. Each baffle has, at its lower edge, a retaining flange provided with an outlet, the outlets being out of vertical alignment. A grating extends across the lower portion of the tower above the baffles, and a supply pipe extends upwards from the well above the grating and is provided with a spray head at the top. An outlet pipe from the well is also provided.—J. H. P.

Disintegrating-machine. W. A. Patterson, Assignor to A. P. and R. H. Boulware, Dallas, Tex. U.S. Pat. 1,286,757, 3.12.18. Appl., 4.2.18.

THE grate of a disintegrator mill is formed of spaced longitudinal bars which are alternately of different height and have exposed cutting edges on their upper corners.—W. H. C.

Crushing-mill. T. J. Sturtevant, Wellesley, Mass., Assignor to Sturtevant Mill Co., Boston, Mass. U.S. Pat. 1,286,831, 3.12.18. Appl., 23.2.18.

THE casing of a disintegrator mill is divided along a vertical plane, parallel with the shaft, into two unequal portions which are hinged together, so that the smaller may be swung aside to allow of access to the interior. The axial shaft and part of the curved crushing surface are supported within the larger portion of the casing and the rest of the crushing surface within the movable portion.—W. H. C.

Refrigerating machine with revolving evaporating chamber. H. Lanz, Mannheim. Ger. Pat. 308,685, 21.1.17.

THE revolving evaporation chamber is provided with a separate shaft which is coupled, inside the suction chamber of the compressor, to the shaft which operates the compression piston. This arrangement permits a permanent union between the evaporation chamber and the compressor shaft, whereby a gas-tight connection is obtained without interfering with the accessibility of the machine for maintenance and repairs.—J. F. B.

Dryer; Continuous automatic —. C. A. Wendell, Joliet, Ill. Reissue 14,574, 17.12.18, of U.S. Pat. 1,088,754, 3.3.14. Appl., 17.6.15.

SEE this J., 1914, 631.

Shaft-kiln. A. and W. Steiger, Zürich, Switzerland. U.S. Pat. 1,287,505, 10.12.18. Appl., 4.8.17.

SEE Eng. Pat. 109,266 of 1917; this J., 1918, 374 A.

Evaporator. N. Deerr, Brooklyn, N.Y. U.S. Pat. 1,287,650, 17.12.18. Appl., 16.8.17.

SEE Eng. Pat. 120,276 of 1917; this J., 1918, 755 A.

Drying. Eng. Pat. 111,112. See XIX A.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Oxidation of —. J. R. Partington. Chem. News, 1919, 118, 50–51.

DISCUSSING the experimental results of R. V. Wheeler (this J., 1919, 65 A) on the slow oxidation of coal at low temperatures (15°–100° C.), the author criticises the hypothesis that air is absorbed by the freshly won coal with the formation of a complex addition compound, and suggests, as an alternative explanation of the observed facts, that the process is primarily one of adsorption. The primary oxidation product is probably carbon monoxide, carbon dioxide being formed only through the agency of moisture, with simultaneous production of hydrogen which, however, was not looked for by Wheeler. The adsorption hypothesis explains the differences observed between the behaviour of moist and dry air, the ratio CO₂/CO being smaller when the air is dried before coming in contact with the coal.—E. H. R.

Coal ash; Fusibility of — and determination of the softening temperature. A. C. Fieldner, A. E. Hall, and A. L. Feild. U.S. Bureau of Mines, Bull. 129, 1918, 146 pages. (See also this J., 1915, 704, 1001, 1079.)

THE investigation was made with a series of ashes, obtained from 110 samples of coal, lignite, and peat, and containing SiO₂, 12.3–76; Al₂O₃, 8.6–34.7; Fe₂O₃, 3.8–69.7; CaO, 0.6–18.6; and MgO, 0.2–10%. The ashes were moulded into the form of Seger cones and heated in furnaces of various types, and at different rates, under oxidising, reducing, and neutral conditions such as occur in different parts of a fuel bed in ordinary boiler practice. The chief factors affecting the softening temperatures were found to be:—*Fineness.* Ash ground to an impalpable powder softened at a slightly lower temperature than ash of 100-mesh size; a fineness of at least 200-mesh was preferred. *Carbonaceous matter.* In atmospheres of air, of hydrogen and water vapour, and of carbon monoxide and carbon dioxide, at rates of heating up to 5° C. per min.,

no appreciable difference in softening temperature was found between cones composed of carbon-free ash and distilled water and similar cones in which a 10% solution of dextrin was employed as binder. At more rapid rates of heating, in the reducing atmosphere of a gas furnace, swelling and intumescence occurred when the cones contained carbonaceous matter. Ignition of the re-ground ash in oxygen was found to promote more definite and reliable softening points, especially when the original ash had been incompletely ignited. *Size and shape of cone.* Since slender cones of coal ash were found not to bend as uniformly as the standard pyrometric cones, the bending tendency was eliminated entirely by increasing the width of the base, and the softening temperature was taken as the point where the cone had become roughly spherical. The best size for this purpose was found to be a cone $\frac{1}{2}$ in. high and $\frac{1}{2}$ in. wide at the base; and the end point was found to be reproducible within 30° C. *Inclination of cones.* Vertical mounting of the cones was found to be the most satisfactory; horizontal or inclined cones generally indicated a softening temperature at too early a stage in the fusion process. *Rate of heating.* Rates below 2° or above 20° C. per min. were unsatisfactory. *Atmosphere.* The highest results were obtained in air (platinum wire resistance furnace) or in a strongly reducing atmosphere of carbon monoxide (Northrup furnace), the iron content of the ash, in the latter case, being reduced to metal and thus eliminated as a flux; and the lowest results in atmospheres of mixed gases (hydrogen and water vapour or carbon monoxide and carbon dioxide) in which the iron was converted mainly into ferrous oxide. By heating the cones in contact with the products of combustion in a gas furnace operated with the maximum excess of gas over air, the required degree of reduction was obtained without production of metallic iron, and the condition of the iron in the softened ash cones was found to approximate to that of the iron in clinker obtained in boiler practice. From the above considerations, the following procedure is recommended as a standard method for determining the softening temperature of coal ash:—Ash of 200-mesh fineness, which has been previously ignited for 2 hrs. in oxygen at 800°–850° C., is moistened with distilled water or with a 10% solution of dextrin and moulded into cones $\frac{1}{2}$ in. high and $\frac{1}{2}$ in. wide at the base. These are dried, set vertically on a support by means of a plastic mixture of kaolin and alumina, and, if containing dextrin, heated in an open muffle for 30 mins. The cones are then heated, within a loosely-covered crucible, in a pot melting furnace having three tangential gas burners near the base and provided with a sighting aperture and thermocouple opening at the sides. The crucible has an opening at the side in alignment with the sighting aperture of the furnace, and the furnace is operated with the maximum excess of gas over air. At 800° C. the temperature increase is reduced to between 5° and 10° C. per min., and this rate is maintained until the end of the test, temperatures being taken by means of an optical pyrometer or protected thermocouple. Record is made of the temperatures at which initial deformation, softening, and actual flowing of the cones occur.

—W. E. F. P.

Water-gas production; Contribution to knowledge of the principles of —. *Decomposition of steam by red-hot charcoal.* J. Gwosdz. Verhandl. ver. Ref. Gewerbfleisses, 1918, 22–45, 55–70. Z. angew. Chem., 1918, 31, Ref., 398.

AS the result of a series of experiments, the author concludes that in the decomposition of steam by red-hot charcoal, carbon monoxide can be produced as a primary product even at a relatively low tempera-

ture, provided experimental conditions are suitably chosen. This result is obtained when charcoal containing a minimum ash content is used. The primary process in water-gas production appears to be the formation of carbon monoxide and carbon dioxide, in relative proportions corresponding to the equilibrium established between these two gases in presence of carbon. Further, at the surface of the charcoal, carbon dioxide is produced by the interaction of carbon monoxide and steam, the extent of this reaction being largely conditioned by the ash content of the charcoal. The quantity of steam decomposed in unit time varies with the surface area of the charcoal (see this J., 1918, 538 A.)

—J. S. G. T.

Water-gas; Soft coal for —. R. B. Harper. Gas Record, Gas J., 1918, 145, 121.

A comparison of the behaviour of bituminous coal with that of good coke in water-gas generators showed that when bituminous coal is employed, considerable clinkering troubles are introduced; there is an increase of as much as 40 B.Th.U. per cub. ft. in the calorific value of the blue water-gas obtained, such increase being liable to cause overheating of parts of the installation; the amount of hydrogen sulphide is increased; the quantity of ash is increased; the daily make of gas with a given installation may be decreased by as much as 5%; 3% of the fuel may be lost in the clinker or ash; and the steam consumed per 1000 cub. ft. of gas is higher than when coke is used.—J. S. G. T.

Benzol in gas; Estimation of —. St. Claire Deville. J. Usines à Gaz, Dec. 20, 1918. Gas J., 1919, 145, 272–273.

The author has revised his earlier freezing method (J. Usines à Gaz, 1889, 13; this J., 1889, 972) to meet the need for determining the benzol content of gases poor in that constituent, *e.g.*, gas which has been scrubbed in order to recover its benzol. The gas, dried by calcium chloride, is passed through a narrow vertical glass vessel which is maintained at a temperature of -81° to -72° C. by immersion in a paste of carbon dioxide snow and acetone. 120 litres (4.24 cub. ft.) per hour of fairly rich coal gas may safely be passed and the whole of the benzol is frozen out. A test can be completed in about 1½ hrs. The cooling agent is contained in a Dewar vessel and will remain below -72° C. for five hours; eight or nine tests can be carried out with a cylinder of liquid CO_2 containing 22 lb. When sufficient gas has been cooled (150 to 200 litres for ordinary coal gas and correspondingly more for poorer gases) the freezing tube is disconnected, closed, and brought to room temperature. The expanded gas is released and the weight of the benzol determined. If the freezing tube contains some liquid at the bottom, immediately it is taken from the Dewar vessel, the presence of toluene (freezing pt., -93° C.) is indicated and a rough estimate of the amount can be made by noting the volume of the liquid. The benzol condensed out during 41 tests, amounting to 400 c.c., had sp. gr. 0.8825, and its composition as determined by distillation, after allowance for a 2.7% loss, was:—Boiling below 80° C., 1.75%; from 80° to 84° , 79.48%; 84° to 90° , 8.20%; 90° to 100° , 2.62%; 100° to 115° , 3.93%; above 115° C., 3.93%. Data are given relating to the past and present benzol contents of Paris gas.—T. F. E. R.

Coke-oven gas; Washing of light-oil fractions from —. F. D. Schreiber. Gas Age. Gas J., 1919, 145, 269.

The washing of benzol, toluol, and solvent naphtha is performed in an agitator of the Koppers type of 5200 galls. capacity. Full charges are always

used and the procedure successfully adopted is tabulated in detail. After washing with acid and water, the oils are washed with lime water, followed in the case of the benzol by a washing with caustic soda. The consecutive use of lime and caustic soda in the benzol washing is efficacious in removing the benzenesulphonic acids which frequently cause corrosion of dephlegmator tubes in subsequent distillation when not removed. The lime must be of high quality, free from grit, and when slaked and made into milk of lime must not deposit suspended matter. In washing solvent naphtha, the charge is prone to heat up considerably and care must be taken to keep it as cool as possible.—T. F. E. R.

Inflammability of gaseous mixtures; Dilution limits of —. Part III. Lower limits of some mixed inflammable gases with air. Part IV. Upper limits of some gases, singly and mixed, in air. H. F. Coward, C. W. Carpenter, and W. Payman. Chem. Soc. Trans., 1919, 115, 27–36.

The lower limits of inflammability of various mixtures of hydrogen, methane, and carbon monoxide with air have been determined, the combustible gases being taken two at a time, or all three together. A mixture of "town's gas" and air was also examined. The results obtained show that the lower limits for the various mixtures may be calculated with fair accuracy from Le Chatelier's formula, according to which if $n_1, n_2, n_3, \dots$ are the proportions of the several combustible gases in the lower limit mixture, expressed in percentages of the total gas mixture, and $N_1, N_2, N_3, \dots$ are the corresponding percentages for each of the combustible gases taken separately, then

$$n_1/N_1 + n_2/N_2 + n_3/N_3 + \dots = 1$$

The upper limiting mixtures have also been determined for hydrogen, methane, and carbon monoxide, and for various mixtures of these gases. The upper limits in air saturated with water vapour at 18° – 19° C. were found to be in the neighbourhood of 74.2% for hydrogen, 15.4% for methane, and 74.2% for carbon monoxide. For mixtures of these gases, the upper limits can be calculated approximately from the additive formula referred to above.—H. M. D.

Flame; Propagation of — through tubes of small diameter. Part II. W. Payman and R. V. Wheeler. Chem. Soc. Trans., 1919, 115, 36–45.

Following the method previously used in experiments with mixtures of methane and air (this J., 1918, 568 A), the authors have determined the speeds of the uniform movement of flame in mixtures of air with coal-gas, hydrogen, and a 1:1 methane-hydrogen mixture, using glass tubes of varying diameter. The results obtained show that not only can the composition of the upper and lower limiting mixtures for mixed combustible gases be calculated from the upper and lower limit data for the individual gases in the mixed combustible by means of Le Chatelier's formula (compare preceding abstract), but that the speeds of the uniform movement of flame can be calculated from a formula of the same type. This formula appears to be applicable to the mixtures, whatever may be the speed of propagation of flame. The experimental data lead to the conclusion that coal-gas is an unsuitable gas for the testing of miners' safety lamps, since small variations in composition have a considerable effect on the speed of propagation of flame in its mixtures with air. The reduction in the proportion of paraffins and increase in the proportion of hydrogen, which occur when carburetted water-gas is employed to dilute the coal-gas, give a mixture which, with air, has a much greater speed

propagation than can be attained by mixtures of methane and air. Moreover, the speed attainable with gas produced solely by carbonisation at normal retort temperatures is more than double that attained in mixtures of methane and air. Although the speed of propagation is the main factor which determines the ability of flames to pass through tubes or holes of small diameter; this appears to depend also on the quality of the inflammable gas. The hydrogen present in coal-gas is in considerable measure responsible for the behaviour of the flame in mixtures of coal-gas and air.

—H. M. D.

Ethane and air; Inflammation of mixtures of — in a closed vessel: the effects of turbulence.
R. V. Wheeler. Chem. Soc. Trans., 1919, 115, 81–94.

THE speed at which flame is propagated through an inflammable mixture in a closed vessel is dependent on the degree of mechanical agitation of the mixture. Experiments made with mixtures of ethane and air near the lower limit of inflammability (3.10% ethane) have demonstrated that mechanical agitation of a mixture poor in combustible gas renders it difficult for the flame, which originates during the passage of the discharge, to spread away from the source and travel throughout the mixture. The difficulty increases as the degree of agitation increases and as the proportion of combustible gas in the mixture is decreased. If, however, the flame spreads in such an agitated mixture, it travels very rapidly. The appearance of the flames in mechanically agitated mixtures of 5.0% methane and air suggests that the action of the form of turbulence used in the experiments is purely mechanical. The flame is forcibly dragged in the wake of the rapid current induced by the revolving fan used as agitator and burns the mixture in its path. In accordance with this view it has already been found by Hopkinson (Rep. Brit. Assoc., 1912, 201) that the rapidity of combustion increases with the degree of turbulence, and experiments with mixtures of ethane and air are now recorded which show that mixtures for which the speed of propagation of flame is normally slow are more susceptible to the influence of turbulence than mixtures for which the normal speed is high. With regard to the rate of development of pressure in non-turbulent mixtures of ethane and air, it is found that the time-pressure curves are of the same type as those previously obtained for mixtures of methane and air (this J., 1919, 3 A). In other respects, the ethane-air mixtures differ notably from those of methane and air. The ethane-air mixtures which produce the highest pressures contain from 6.5 to 7.0% of ethane, whilst the mixture corresponding with complete combustion contains only 5.63% of ethane. The speed of propagation under the conditions of the experiments (central ignition in a spherical vessel) is also greatest for mixtures which contain 6.5 to 7.0% of ethane.—H. M. D.

Paraffin wax and its manufacture. A. Campbell and W. J. Wilson. Inst. Petrol. Techn., Jan. 21, 1919. [Advance proof.]

It is estimated that 350,000 tons of paraffin wax is produced annually by the distillation of crude petroleum and shale oil. American crude oils yield 2 to 3% of paraffin wax, whilst Scotch shale oil contains about 11%, Galician petroleum 5 to 6%, and Burma and Assam crude oils 12% or more. A considerable amount is also present in Borneo and Persian crude oils, but the latter have not yet been commercially worked. Experiments to determine the effect of varying the conditions on the results of sweating the crude wax showed that a much greater yield of white wax is obtained in less

time by sweating of the total scale than by sweating the hard and soft scales separately. For example, a hard scale melting at 129° F. (54° C.) and a soft scale melting at 113° F. (45° C.), when mixed in the proportions in which they were obtained, melted at about 120.5° F. (49° C.). When these scales were separately sweated only 17.26% from the soft scale reached the proper colour, whilst 58.33% of the combined residues was yellow and required re-sweating to obtain the maximum yield of white wax. When, however, the scales were combined proportionately and sweated, 41.8% of white wax was obtained in one operation, and only 42.24% required re-sweating, and this gave a further yield of 32% of white wax. The sweating was carried out in 5 stages of 6 hours each with rises of 5° F. (2.8° C.), and thus 30 hours was required to sweat the scales separately to residues of m.pt. 135.5° F. (57.5° C.) and 125° F. (51.5° C.) respectively, only the latter being white, whilst the same size of apparatus produced more than double the yield of white wax from the same quantity of the combined scales in 42 hours. It was subsequently found that equally good results could be obtained by reducing the stages to 4 of 4 hours each, with rises of 10° F. (5.5° C.) between each. By mixing, crystallising, and re-sweating the sweatings from the first and second stages 6.5% of a yellowish oily wax of m.pt. 122.5° F. (50.2° C.) was recovered. In experiments to determine the bending-point of candles composed of mixtures of paraffin wax and stearine, candles 7½ in. long and 1½ in. diameter were exposed for 30 mins. at successive stages rising by 5° F. until they bent from the perpendicular. The following results were obtained with mixtures of paraffin waxes melting at 139° F. (59° C.) and 133° F. (56° C.) respectively with stearine melting at 130.5° F. (54.5° C.) :—

Paraffin wax, m.pt. 139° F.	Stearine	Melting point	Bending point	Paraffin wax, m.pt. 133° F.	Stearine	Melting point	Bending point
%	%	°F.	°F.	%	%	°F.	°F.
100	—	133	93	100	—	139	110
80	20	129	108	80	20	135.5	119
70	30	127	109	70	30	133.5	120
60	40	124	115	60	40	133	125

Mixtures of paraffin wax with stearine frequently show a lower m.pt. than that of either constituent. For example, a mixture of 55% of stearine of m.pt. 130° F. (54.5° C.) with 45% of paraffin wax of m.pt. 120° F. (49° C.) melted at 114° F. (45.5° C.). In the Henderson apparatus for separating the scale from petroleum distillates, 2400 galls. can be cooled from 86° F. (30° C.) to 35° F. (1° C.) in 24 hours by means of brine at 13° F. (–10.5° C.); whilst 1500 galls. of an average paraffin distillate can be cooled from 120° F. (49° C.) to 40° F. (4° C.) and pumped through the filter-presses in the same time, with brine at 16° F. (–9° C.). Similar variations are shown by other types of coolers. The following are examples of sweating in the tray form of stove and in cylindrical stoves :—

	Tray form of stove	Cylindrical stove
M.pt. of scale ..	126°–127° F.	111° F.
Time of cooling ..	24 hours	12 hours
White wax sweating ..	35	48
White wax as residue ..	31.5% m.pt. 138° F.	33.3% m.pt. 127° F.
Sweatings, yellow ..	59.5% .. 120° F.	31.4% .. 113° F.
Soft sweatings and oil ..	9.0% .. 106° F.	9.0% .. 100° F.

The complete operation in the tray form of stove takes about 58 hours, the time of cooling and

sweating varying with the composition of the scale, as for example:—

M.pt. of mixture	Time for filling	Time for cooling	Time for sweating	Time for melting
°F.	Hours	Hours	Hours	Hours
127	1	21	17	31
117	1	31	17	21
108	1	28	11½	21

—C. A. M.

Ignition of explosive gases by electric sparks. J. D. Morgan. Chem. Soc. Trans., 1919, 115, 94—104.

In continuation of experiments made by Wheeler and Thornton (Home Office Report on Electric Signalling with Bare Wires, June, 1916) on the ignition of explosive gases by sparks produced in signal bell circuits, the author has made a series of new observations with low-tension sparks covering a wide range of variation in the magnetic conditions. The results obtained with air-core coils, open iron-core coils, and closed iron-core coils lead to the conclusion that under widely varying conditions the igniting sparks are characterised by the liberation of the same amount of heat energy. This is not apparent from measurements on the spark circuit prior to the production of the sparks. Reviewing the results of recent work on the spark ignition of explosive gases, it is found that the igniting power of a spark does not depend on its total energy. In consideration of the author's results for ignition with low-tension sparks, it would therefore seem that the whole of the energy of the spark is not utilised in the process of ignition. The suggestion is made that the ignition is determined by the initial spark energy and that in every spark there is a certain amount of unused energy which makes no contribution to the process of ignition. This view may offer an explanation of the diverse results which have been obtained in attempts to specify the inflammability of an explosive mixture in terms of the total energy of the least igniting spark.—H. M. D.

PATENTS.

Fuel and process of forming the same. D. Markle. Hazleton, Pa. U.S. Pat. 1,287,382, 10.12.18. Appl., 11.9.17.

A MIXTURE of anthracite culm and hard pitch is heated to distil off the volatile constituents of the pitch without forming coke.—W. F. F.

Coke ovens or the like. J. Pieters. Paris. Eng. Pat. 113,782, 22.1.18. (Appl. 1274/18.) Int. Conv., 28.2.17.

VERTICAL coke ovens oblong in horizontal cross-section are arranged in a setting and are heated by a large number of vertical flues or combustion chambers arranged in the upper part of the dividing walls, each set of flues opening into a common horizontal discharge flue. The air for combustion passes upwards through zigzag passages in the lower part of the dividing walls and meets the combustible gas, which may be rich coke-oven gas, at the bottom of the combustion chambers. The heat of the descending coke is thus recovered, and transferred to the air. The cooling passages have a surface approximately equal to that of the heating flues. When the ovens are heated by means of cold poor gas obtained from blast furnaces, both the gas and the air for its combustion are preheated by circulating them through two separate sets of flues in the lower parts of the dividing walls of the ovens. The coke is discharged and removed by means of a cutting device and a conveyor. (Reference is

directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 1689 of 1881 and 101,306; this J., 1885, 199; 1916, 1006.)

—W. F. F.

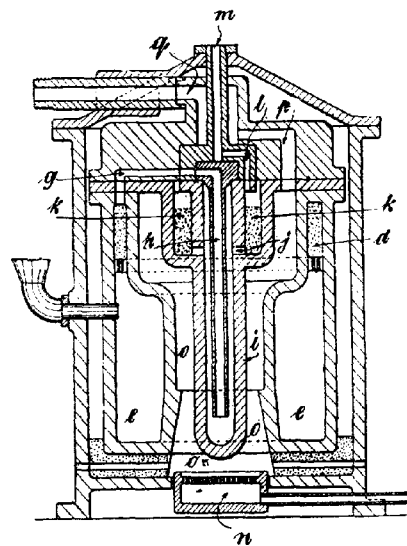
Gas; Retorts and apparatus in connection therewith for use in the manufacture of —. Drakes Ltd., and J. W. Drake, Halifax. Eng. Pat. 121,975, 4.10.17. (Appl. 14,317/17.)

A PAIR of vertical retorts is mounted on, and in communication with, a pair of horizontal retorts, the whole being arranged in a common setting with a pair of producers at a lower level. The outlet of each producer is divided into two conduits which are controlled by a single damper, so that the producer gas may pass either into a common chamber leading into both horizontal retorts, or into the heating chamber surrounding the two sets of combined retorts. Coal may be fed into the retorts and coal gas produced by the heat of the producer gas circulating through the heating chamber. The producer gas may be partly burnt if necessary, by admitting air to the heating space after passing it through a preheater in the flues leading from the heating chamber. Alternatively the producer gas may be passed through the retorts to obtain a mixture of coal gas and producer gas. Producer gas may also be withdrawn for use separately. The retorts may be charged with coke, and air and steam blown through them alternately for the continuous production of water-gas; or steam may be blown through the retorts charged with coal, while producer gas is being passed through them, and thus a mixture of coal gas, producer gas, and water-gas, in any desired proportions, may be obtained. The apparatus may also be used for the manufacture of hydrogen by filling the retorts with iron, heating them by burning producer gas in the surrounding heating chamber, and passing steam through them.

—W. F. F.

Gases; Combustible —. W. Pickard, Rochdale, and D. R. Dobson, Bolton. Eng. Pat. 122,079, 15.3.18. (Appl. 4589/18.)

THE compartment, *e* (see fig.), is partly filled with a mixture of crude hydrocarbon and acidulated water, which is vaporised by means of a burner, *n*.



The mixed vapour passes through the compartment, *d*, filled with iron filings, and thence through the passage, *g*, tube, *h*, strongly heated casing, *i*, and

passage, *j*, to the compartment, *k*, which is filled with a mixture of iron filings and charcoal. The compartments, *d* and *k*, are kept hot by the hot gases passing through the space, *o*, and passage, *p*, to the outlet, *q*. The permanent gases leaving the compartment, *k*, through the passage, *l*, are withdrawn at the outlet, *m*. Gas suitable for internal combustion engines may be obtained from a mixture of water 2 parts, heavy tar oil 1 part, together with about 1% by volume of sulphuric acid.—W. F. F.

Gaseous mixtures; Proportioning of combustible —. A. C. Ionides, jun., London. Eng. Pat. 122,215, 13.12.17. (Appl. 18,508/17.)

A COMBUSTIBLE mixture of gas and air in such proportions that combustion will not continue under normal conditions is passed through a control valve and a back-flash extinguishing device such as that described in Eng. Pat. 12,346 of 1912 (this J., 1913, 412) to a small horizontal nozzle of silica glass having a flared mouth. The mixture will burn continuously at such a mouthpiece, and the character of the flame is observed against a semi-cylindrical blackened trough projecting in front of and below the mouthpiece. In a modification, continuous combustion may be secured by heating the combustible mixture as it passes through a tube of small bore to the nozzle. A pressure gauge is provided on a branch pipe between the regulating valve and the back-flash extinguishing device, and the proportions of the mixture may be determined and regulated by comparison of the flame with that produced by known mixtures. The length of the flame may be measured by a scale on the semi-cylindrical trough, and the whole apparatus may be enclosed in a portable casing.—W. F. F.

[*Fuel*] *gases; Process for manufacturing* —. H. F. Freuler, Walla Walla, Wash. U.S. Pat. 1,286,577, 3.12.18. Appl., 6.6.16.

A MASS of carbonaceous material is heated by an electric current of high voltage, and when its resistance is lowered, the electrodes are separated farther apart and the applied voltage is reduced. Superheated steam is then injected and the resulting mixture of carbon monoxide and hydrogen is drawn off.—W. F. F.

Petroleum oils; Process of refining mineral —. R. E. Humphreys, Assignor to Standard Oil Co., Whiting, Ind. U.S. Pat. 1,286,179, 26.11.18. Appl., 17.5.15.

THE oil is treated with strong sulphuric acid, and the acid sludge drawn off. The oil, containing a small proportion of dissolved sulphonic acid, is neutralised with caustic soda, and the resulting solution of alkali salt in mineral oil is extracted with a dilute solution of alcohol.—W. F. F.

Petroleum and the like; Method of and apparatus for distilling —. L. O. Sherman, East Chicago, Ind. U.S. Pat. 1,288,711, 24.12.18. Appl., 13.11.17.

A PORTION of the oil is vaporised by heating in a still under pressure, and higher boiling fractions are condensed in a return-condenser connected with the still. The condensed liquid, together with a portion of the oil from the still, is passed into one end of a pipe in which it is heated to a temperature higher than that of the oil in the still and at a pressure above that of the initial vaporisation. The other end of the pipe opens into the vapours passing into the return-condenser. Lower-boiling fractions are condensed separately, and the condensed liquid is collected.—L. A. C.

Fuel; Pulverised —. N. K. H. Ekelund, Jönköping, Sweden. Eng. Pat. 122,214, 17.11.17. (Appl. 16,978/17.)

SEE Ger. Pat. 306,727 of 1917; this J., 1918, 616 A.

Coke; Manufacture of —. A. McD. Duckham, Ashtead. U.S. Pat. 1,289,045, 24.12.18. Appl., 19.5.15.

SEE Eng. Pat. 17,502 of 1914; this J., 1915, 787.

Heating wash-oils [in benzol recovery]. Ger. Pat. 306,570. See 111.

Carbon dioxide analyser. U.S. Pat. 1,285,927. See XXIII.

III.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Decolorising and purifying agent [carbon] and method of making the same. R. W. Mumford, New York, Assignor to Refining Products Corporation, Wilmington, Del. U.S. Pat. 1,286,187, 26.11.18. Appl., 11.5.17.

FINE-GRAINED carbon for decolorising purposes is prepared by mixing granular, moist, vegetable matter, containing colloid substances, with granular dolomite and manganese dioxide, and heating the mixture slowly to a temperature above 600° C., whereby the vegetable material is charred and the pores of the carbon are cleansed by the gases evolved from the mineral matter. The product is then cooled out of contact with air and the mineral matter removed.—W. E. F. P.

Decolorising carbon; Process of making —. R. W. Mumford, New York, Assignor to Refining Products Corporation, Wilmington, Del. U.S. Pat. 1,287,592, 10.12.18. Appl., 15.1.18.

MOIST comminuted carbonaceous or vegetable matter is mixed with pulverised dolomite to form a plastic material, which is placed in shallow layers in metal trays and subjected to a gradually increasing temperature rising above 800° C., with precautions to avoid any sudden rise in temperature. The carbonaceous material is quenched in water with exclusion of air, and the mineral matter removed as a sediment. The carbon is dried in a rotating heated tube by means of the gases from the carbonising furnace. In a modification, the dolomite is replaced by the product of the reaction of milk of lime and mono-calcium phosphate, and the carbon is similarly dried by means of dry steam.—W. F. F.

Electrode; Arc-lamp —. W. R. Mott, Lakewood, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,289,514, 31.12.18. Appl., 28.1.16.

AN arc-lamp electrode is composed of carbon, calcium fluoride, and rare-earth compounds substantially free from cerium, and consisting, to the extent of one-third or more, of yttrium fluoride.—B. N.

Seal for electric apparatus. U.S. Pat. 1,288,916. See XI.

III.—TAR AND TAR PRODUCTS.

Pyridine and ammonia; Estimation and separation of —. An application of the electrolytic dissociation theory. E. B. R. Prideaux. Faraday Soc., Jan. 21, 1919. [Advance proof.] 10 pages.

THE best indicator for the titration of ammonia with an acid is methyl red, but lacmoid is also good for dilute solutions; for pyridine the best indicator is congo or methyl violet, the acid used being preferably nitric acid. Based on electrochemical considerations, calculations are made as to the correct conditions for the titration of pyridine, alone or in the presence of ammonia, and for the separation of the two by distillation. For the titration of ammonia in the presence of small quantities of pyridine, α -naphtholphthalein is a good indicator, the amount of pyridine being subsequently determined by the addition of congo and continuing the titration; rosolic acid can also be used as indicator but is not as satisfactory as α -naphtholphthalein. The partial separation of ammonia and pyridine can be effected by distillation from a solution of which the acidity is maintained at such a degree as to produce a reddish-brown colour with congo or an orange colour with methyl orange; the distillate contains no ammonia but most of the pyridine, which may be estimated by titration; the residual liquid contains all the ammonia and a little pyridine, which are then liberated by the addition of alkali and titrated after removal by further distillation. The degree of acidity for the first distillation is obtained by adding a small excess of N/1 sulphuric acid and then introducing disodium hydrogen citrate until the necessary condition is reached.

—D. F. T.

Benzol in gas. St. Claire Deville. See IIa.

Washing light oils. Schreiber. See IIa.

PATENTS.

Wash-oils [in benzol recovery processes]; Process for retarding corrosion of vessels used for heating —. A. Krieger, Ickern. Ger. Pat. 306,570, 5.8.17.

APPARATUS used for recovering benzol from wash-oils is frequently rendered useless after a relatively short time by corrosion of the heating coils due to the presence of ammonium salts in the wash-oil. To overcome this difficulty it is proposed to heat the wash-oil in presence of alkali or alkaline-earth hydroxides or of metals, such as iron.

Phenanthraquinone; Process for the manufacture of —. H. F. Lewis, Urbana, Ill., and H. D. Gibbs, San Francisco, Cal. U.S. Pat. 1,288,431, 17.12.18. Appl., 10.1.18. (Dedicated to the public.)

PHENANTHRAQUINONE is prepared by heating phenanthrene vapour mixed with air to 300°–500° C. in the presence of oxides of metals of the fifth and sixth groups of the periodic system.—L. A. C.

IV.—COLOURING MATTERS AND DYES.

Pyrrrole Black; New mode of formation of —. A. Angeli and A. Pieroni. Atti R. Accad. Lincei, 1918, 27, II, 300–304. (See this J., 1918, 685 A.)

AN intensely coloured Pyrrrole Black may be obtained by the action of air on a dilute ethereal solution of magnesium ethyl iodide and pyrrrole. (See also J. Chem. Soc., 1919, I, 134.)—T. H. P.

PATENTS.

[Vat dyes.] Manufacture of chlorinated derivatives of N-dihydro-1.2.2'-1'-anthraquinoneazine. Ges. für Chem. Ind. in Basel, Switzerland. Eng. Pat. 113,783, 28.1.18. (Appl. 1633/18.) Int. Conv., 27.2.17.

THE chlorination of finely divided N-dihydro-1.2.2'-1'-anthraquinoneazine (indanthrene) may be efficiently carried out, with excess of chlorine, in a non-aqueous inorganic liquid containing halogen, other than chlorosulphonic acid, such as sulphuryl chloride, thionyl chloride, sulphur chloride, phosphorus oxychloride, antimony pentachloride, or bromine. The indanthrene may be halogenated to tri- or tetra-chloro derivatives and these may be readily reduced, giving vats which yield dyeings or printings perfectly fast to chlorine. Under these conditions the dihydro-azine is not oxidised to azine, as is the case when sulphuric or chlorosulphonic acid is used. When indanthrene is suspended in bromine for a long period a bromo-derivative is obtained which is fast to chlorine but is very difficult to vat. By passing chlorine through bromine in which indanthrene is suspended, halogen derivatives free from bromine are produced.—L. L. L.

Anthraquinone derivative and process of making same. Vat colour and process of making same. G. Kallischer, Mainkur, Germany. U.S. Pats. (A) 1,285,726 and (B) 1,285,727, 26.11.18. Appl., 25.2 and 28.2.18. Renewed 30.4.18.

(A) 1-AMINOANTHRAQUINONE-2-ALDEHYDE is prepared by treating with acids the condensation products obtained by heating 1-amino-2-methylantraquinone with aromatic nitro compounds in the presence of alkalis, alone or with the addition of primary aromatic amines. The aldehyde produced melts at about 235° C., dissolves in concentrated sulphuric acid with a brown colour which, on addition of paraformaldehyde, changes to an intense blue; it yields with hydrosulphite and caustic soda a bright green vat. (B) 1-Aminoanthraquinone-2-aldehyde is condensed with hydrazine, yielding a dark red dyestuff, very sparingly soluble in organic solvents of high boiling point and giving with hydrosulphite and caustic soda a vat which dyes cotton claret-red shades of very good fastness. The same dyestuff is also produced by condensing the azomethine compounds corresponding to 1-aminoanthraquinone-2-aldehyde, which form the intermediate stage in the preparation of the latter substance, with hydrazine. It is soluble in concentrated sulphuric acid with an olive colour, changed on the addition of paraformaldehyde to an intense greenish-blue.—J. F. B.

[Azo] dyestuff of the pyrazolone series and process of making same. E. Reber, Assignor to Society of Chemical Industry in Basle, Switzerland. U.S. Pat. 1,286,411, 3.12.18. Appl., 15.2.18.

Azo dyestuffs of the pyrazolone series are prepared by combining a diazo compound of an amine, which is not substituted in its ortho position by a hydroxyl or a carboxyl group, with 1-phenyl-3-methyl-5-pyrazolone, having a hydroxyl and a carboxyl group in the phenyl radicle.—L. L. L.

Dye. S. M. Tootal, Blackpool. U.S. Pat. 1,289,968, 31.12.18. Appl., 20.11.17.

See Eng. Pat. 111,365 of 1916; this J., 1918, 5 A.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Beating tests [for paper pulp]. E. Sutermeister. Pulp and Paper Mag., 1919, 17, 47–49.

MANY useful results in testing the quality of wood pulps and the influence of certain chemical factors in the operation of beating have been obtained by

treating the fibre in a small porcelain ball-mill. Thus the superiority of moist sulphite pulp, which has never been dried, over the same pulp, steam dried, has been demonstrated by comparing the strength of papers prepared from pulps beaten in this way. On the other hand, experiments made to ascertain the influence of chemical solutions on the behaviour of the pulp during beating have led to very divergent conclusions on the part of different observers when beating in the presence of alkalis, although there is no doubt as to the injurious effect of bleaching powder and acid solutions. This method of testing has further demonstrated the deterioration of dry unbleached sulphite pulp when stored for a number of years exposed to air, light, and all normal indoor changes of humidity, the decrease in strength being accompanied by a change in the fibre, which became less absorbent and more difficult to break up into pulp. Another method of employing the beating test is to beat the fibre for periods increasing from 10 to 50 minutes and to note the course of the development of strength in the papers made at intervals during the period. Some observers experience trouble due to the rolling up of the fibres into knots by this method of beating, whereas others never encounter knots at all. This difference can only be attributed to some difference in the conditions of beating, and in order to produce comparable results the dimensions of the mill, the number, size, and weight of the balls, the consistency of the pulp, and the relative volume occupied by the pulp should be recorded for standardisation. Further, in making comparative studies great care should be taken to compare the strengths of sheets having approximately the same weights, since it is shown that the strength to weight ratio is not a constant for the same pulp. A sheet-making machine can be operated to give sheets of constant weight, whereas hand-moulds tend to give sheets of decreasing weights as the beating is prolonged.—J. F. B.

Wood pulps in paper; Detection of soda and sulphite — R. Wasicky. Papierfabrikant, 1918, 16, 212–213, 228–229. Z. angew. Chem., 1918, 31, Ref., 371.

Pieces of the paper to be examined are boiled up once with a 0.2% aqueous solution of Gentian Violet, allowed to remain in the liquid for 2 minutes, rinsed with 95% alcohol, and steeped for 2 minutes in 95% alcohol containing 0.5% of hydrochloric acid. They are subsequently washed for 15 minutes in 95% alcohol, which is renewed once, and finally washed in water. Papers made of pure soda wood pulp lose the colour entirely, whereas sulphite papers are stained a deep violet. Papers of mixed composition may be analysed with an accuracy of about 5% by comparing them with known standards.—J. F. B.

Absorption of water by vulcanised fibre. Allen. See XI.

PATENTS.

Paper, paper-board and like material; Apparatus for drying — in the course of manufacture. Thames Paper Co., Ltd., and J. B. J. Privett. Purfleet, Essex. Eng. Pat. 122,352, 31.5.18. (Appl. 9026/18.)

THE drying cylinders or vessels of a paper machine are connected with an air pump in such a way that a partial vacuum is maintained in the header or pipe leading from the drying cylinders or vessels, so that the condensed water and accumulated air are drawn off from the drying cylinders and passed through a condenser, whence the water may be returned to the boiler through a hot well or pump. In case exhaust steam at low pressure

is employed for drying the paper, a reheater is interposed through which the steam is passed before it enters the cylinders. The reheater may be heated by electricity or gas, with an arrangement for the automatic regulation of the temperature of the steam passing through.—J. F. B.

Paper; Dryer for coated — J. Janson. Lawrence, Mass. U.S. Pat. 1,287,027, 10.12.18. Appl., 15.5.18.

A DRYER for coated paper comprises a pair of rotary supports arranged to sustain a web of paper with its coated surface uppermost and to permit the web to be loosely suspended between them in a loop; means are provided to feed the web without engagement with its coated surface and to flex it oppositely as it is fed, while heated air is simultaneously applied to the coated surface.—J. F. B.

Drying apparatus [for paper or fabrics] and method of drying. J. O. Ross, Assignor to B. F. Sturtevant Co., Boston, Mass. U.S. Pat. 1,287,110, 10.12.18. Appl., 8.12.13.

AN apparatus for drying webs of paper or fabric comprises a conveyor for carrying the web, a blower, an air conduit extending longitudinally along the web, and a tubular nozzle for discharging a stream of air from the conduit, impinging against the middle portion only of the web, in order to counteract the tendency to dry more rapidly at the edges than at the middle.—J. F. B.

Drying material in the form of webs; Apparatus for — B. R. Andrews, Braintree, Mass. U.S. Pat. 1,287,172, 10.12.18. Appl., 25.1.18.

IN a drying machine having a number of poles over which the web material to be dried is festooned, means are provided to deliver the web material to the poles successively and to direct a current of air against the web as it is being laid over each pole.—J. F. B.

[Roofing] felt; Composite — and process of making the same. Method of making construction materials. R. P. Perry, Upper Montclair, N.J., Assignor to The Barrett Co. U.S. Pats. (A) 1,288,158 and (B) 1,288,159, 17.12.18. Appl., 14.4 and 1.11.17.

(A) A composite sheet is made of paper consisting of a layer containing a definite quantity of finely divided fusible bituminous matter and at least one other united to the first, but containing a smaller proportion of bituminous matter (B) Finely divided fibrous material is added to segregated particles of fusible waterproofing material whilst the latter are in a soft adherent condition and the mixture is then formed into a sheet by pressure.—A. B. S.

Cellulose or cellulosic materials; Preparation of solutions of — Zellstoff-Fabrik Waldhof, and V. Hottenroth, Mannheim-Waldhof. Ger. Pat. 306,818, 3.1.17.

CELLULOSE is dissolved in a mixture of hydrochloric and sulphuric acids containing less than 39% HCl, for instance, in a mixed acid containing 34.7% HCl, 5.5% H₂SO₄, and 59.8% H₂O.—J. F. B.

Paper-making; Treatment of certain plants for — C. Beadle, London. U.S. Pat. 1,286,502, 3.12.18. Appl., 19.6.17.

SEE Eng. Pat. 116,005 of 1917; this J., 1918, 409A.

Waste flux from galvanising. Eng. Pat. 121,984. See X.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.**PATENTS.**

Bleaching process. A. E. Jury, New York, Assignor to National India Rubber Co. U.S. Pat. 1,289,803, 31.12.18. Appl., 11.3.16.

TEXTILE material is bleached, then soured with an inorganic acid, treated with alkali to neutralise any remaining acid, and excess of alkali is finally neutralised by a volatile organic acid.—S. S. A.

Cloth dyeing, bleaching and like machines. R. Jackson, Chinley. Eng. Pat. 121,987. (Appls. 18,011, 5.12.17, and 18,933, 21.12.17.) Addition to Eng. Pat. 110,715 (this J., 1918, 6A).

IN machines of the type specified in the original patent, having alternately positively driven guiding rollers together with squeezing rollers, the rolls are coupled together in pairs by frictional means so proportioned that in use the non-positively driven guide roller tends to accelerate the motion of the oppositely disposed squeezing roller. The guide rollers may be so interconnected that both rolls are driven at the same peripheral speed. Braking devices may be fitted to the cloth reel. A baffle is provided in the beck so that the dyestuff solutions or other chemicals may be added without splashing the rollers or the end fents of the goods.—J. F. B.

Dyeing, mordanting, bleaching, scouring or similarly treating wool, slubbing, yarn and other fibrous material; Apparatus for —. J. Kershaw and J. T. Cole, Menston, Yorks. Eng. Pat. 122,227, 5.1.18. (Appl. 279/18.)

THE apparatus is of the type in which the material is placed in a tank or vat between a movable, perforated false bottom and a fixed lattice top, both the lattice top and the false bottom being preferably made in sections, and is repeatedly compressed when saturated with liquor and allowed to open out or expand after each compression (see Eng. Pat. 16,329 of 1908; this J., 1909, 979). The false bottom is raised slowly during compression and then lowered rapidly. By means of pipe connections and stopcocks, the liquid may be passed through the material in either direction without reversing the pump. A spraying device is provided, located above the lattice top. The machine may be provided with an apparatus for raising the lattice top, and fitted with an attachment for treating material in hank form.—L. L. L.

Bleaching, dyeing, finishing and otherwise treating fabrics; Apparatus for use in connection with machines for —. J. Thornber and A. B. Henshilwood, Bradford. Eng. Pat. 122,241, 15.1.18. (Appl. 846/18.)

THE apparatus consists of a wagon or "coach" fitted with adjustable bearings to receive the axial shaft of a roller so that coils of fabric, "batched" upon the roller, may be transferred from one bleaching, dyeing, or finishing machine to another, or unwound from it on to another machine, without the necessity of lifting the batch by hand labour. The axle is fitted with a weighted friction rope in order to deliver the fabric from the wagon to any other machine under proper tension. The machines are fitted with suitable detachable devices for the transference of the batch of fabric from the machine to the wagon, or *vice versa*.—L. L. L.

Yarn and like textile fibres; Machines for treating —. H. Smethurst, Hollingwood, Lancs. Eng. Pat. 122,309, 20.7.18. (Appl. 3605/18.)

PERFORATED tubes or bobbins, closed at one end, on which the yarn is wound, are fed from a hopper into holders carried by an endless belt. When the bobbins, in the holders, have been carried into suitable positions in the machine, they are clamped against liquid-supply connections and may be treated with a regulated quantity of liquid, and followed if necessary by aeration by means of compressed air. The bobbins, after treatment, are then automatically discharged from the belt.

—L. L. L.

Yarn-treating machine. W. J. Going, Amsterdam, N.Y., Assignor to Klauder-Weldon Dyeing Machine Co., Yardley, Pa. U.S. Pat. 1,287,062, 17.12.18. Appl., 6.4.16.

THE machine comprises an impregnating tank and a pair of squeezing rollers. One of the rollers is covered with several lappings of an absorbent textile material, fixed to the roller at one end so as to be easily removed.—S. S. A.

Dyeing fabrics and the like; Method of and means for —. E. J. Wilkinson, Manchester, Assignor to Bradford Dyers' Association, Ltd., Bradford. U.S. Pat. 1,287,543, 10.12.18. Appl., 7.7.15.

SEE Eng. Pat. 17,215 of 1914; this J., 1915, 902.

Wool-like effects on cotton fabrics; Process for producing —. G. Heberlein, Wattwil, Switzerland. U.S. Pat. 1,288,884, 24.12.18. Appl., 18.5.16.

SEE Eng. Pat. 100,483 of 1916; this J., 1916, 1067.

Cotton fabrics; Process for imparting a transparent appearance to —. G. Heberlein, Wattwil, Switzerland. U.S. Pat. 1,288,885, 24.12.18. Appl., 6.6.18.

SEE Addition of 30.11.15 to Fr. Pat. 468,642 of 1914; this J., 1917, 133.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; Effect of phosphine and hydrogen sulphide on the oxidation of — to nitric acid. G. B. Taylor and J. H. Capps. J. Ind. Eng. Chem., 1919, 11, 27–28.

PURE acetylene has no effect on the catalytic action of platinum in oxidising ammonia to nitric acid (see this J., 1918, 465A), and hydrogen sulphide in low concentrations has no immediate toxic effect. Phosphine to the extent of two or three parts per hundred million in the ammonia-air mixture diminishes the yield of nitric acid by several per cent., whilst with 20–30 parts per 100,000 the yield is very seriously affected. Phosphine is a sufficiently active catalyst poison to account for previous results obtained with crude acetylene and the difficulty of efficiently oxidising ammonia prepared from cyanamide is almost certainly due to the phosphine present. The phosphine appears to exert a cumulative action, since the platinum becomes less efficient with use.—T. H. P.

Nitrous vapours; Constitution of —. P. Jolibois and A. Sanfourche. Comptes rend., 1919, 169, 235–237.

WHEN nitric oxide and oxygen are mixed in the proportion of 4:1 by volume, combination is instantaneous at the ordinary temperature, nitro-

gen trioxide, N_2O_3 , being formed and remaining stable. If the gases are mixed in the proportion of 2:1 the combination very rapidly reaches the stage N_2O_3 and subsequently the peroxide is formed to the extent of 34% in 20 secs., the transformation being complete after 100 secs.; even if oxygen is supplied in excess the time required for the formation of the peroxide is of the same order. If the nitrous vapours are submitted to a temperature of $400^\circ C.$, the equilibrium tends towards N_2O_3 .—W. G.

Hydrochloric acid; Estimation of solutions of — and of ammonia by weighing ammonium chloride, and the volatilisation of this salt at different temperatures. Auger. Bull. Soc. Chim., 1918, 23, 467—472.

A REPLY to Villiers (Bull. Soc. Chim., 1918, 23, 306) in which the author reaffirms the loss in weight of ammonium chloride when heated at $100^\circ C.$ even in narrow-necked flasks.—W. G.

Potassium cyanide; Action of — on ammoniacal copper sulphate, and its application to the determination of hydrocyanic acid and copper. L. Jennesscaux. Ann. Chim. Analyt., 1919, 4, 15—20.

WHEN a cyanide solution is treated with a drop of copper sulphate solution and a small quantity of sodium hydroxide solution, and then acidified with sulphuric acid, a white precipitate is obtained. In this reaction, which was described originally by Lassaigne, only a portion of the cyanide enters into combination, the greater part being converted into cyanogen, but it may be rendered much more sensitive if the copper sulphate solution is treated previously with sufficient sodium bisulphite to change the colour of the solution from blue to green. The test will then detect as little as 0.002 mgrm. of hydrocyanic acid in 1 c.c. of solution. Another sensitive reagent for hydrocyanic acid may be prepared by adding 100 c.c. of 4.99% (N/5) copper sulphate solution to a mixture of 80 c.c. of N/1 ammonia and 20 c.c. of water. If potassium cyanide solution is added to this reagent a crystalline blue-green precipitate, having the composition $2Cu(CN)_2 \cdot Cu(CN)_2 \cdot 4NH_3$, is first formed; on the addition of a further quantity of cyanide, the solution becomes colourless and the precipitate dissolves. This requires a definite quantity of cyanide and if the reagent is standardised against pure potassium cyanide it may be used for the volumetric determination of cyanides. Conversely, the reaction may be applied to the determination of copper.—W. P. S.

Barytes; Analysis of —. Frenkel. Ann. Chim. Analyt., 1919, 4, 10—12.

WHILE commercial barytes is in some cases practically pure barium sulphate, specimens are met with containing 6% of silica and appreciable quantities of alumina; other specimens contain but little silica and up to 10% of calcium sulphate. The content of barium sulphate is best determined by reducing the substance by heating to bright redness in an atmosphere of coal-gas, for 15 mins., dissolving the mass in boiling water, decomposing the sulphide with hydrochloric acid, boiling the solution to expel hydrogen sulphide, and then precipitating the barium with sulphuric acid. If calcium sulphate is present it may be separated by shaking about 1 gm. of the finely divided sample with 50 c.c. of water at $38^\circ C.$, filtering the mixture, and washing the residue; the calcium is then determined in the filtrate. The author has examined certain specimens of barytes which contained organic

matter; these samples gave an abnormal loss when ignited owing to reduction of the sulphate.

—W. P. S.

Osmium tetroxide; Reduction of — by hydrogen chloride. O. Ruff and S. Mugdan. J. prakt. Chem., 1919, 98, 143—144.

WHEN treated with hydrochloric acid, osmium tetroxide remains mostly unchanged, a small proportion undergoing reduction to the dioxide but not to the monoxide, as stated by Milbauer (J. prakt. Chem., 1917, 96, 187; see also J. Chem. Soc., Mar., 1919.)—T. H. P.

Pyridine and ammonia. Prideaux. See III.

Silicate specific heats. White. See VIII.

Iodine tincture. Raubenheimer. See XX.

PATENTS.

Sulphuric and hydrochloric acids; Process for manufacture of —. H. V. Welch, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,285,856, 25.11.18. Appl., 10.5.17.

By reaction between sulphur dioxide, chlorine, and steam a mixture is produced from which, by partial cooling, practically all the sulphuric acid is condensed in the form of finely divided, suspended particles, while the hydrochloric acid remains in the gaseous state. The sulphuric acid is then separated by electrical precipitation.

—W. E. F. P.

Hydrofluoric acid; Production of —. E. S. Fickes, Pittsburgh, Pa. U.S. Pat. 1,288,400, 17.12.18. Appl., 31.3.14. Renewed 14.8.18.

AN elongated, horizontal retort, consisting of a number of cast iron sections joined end to end, has a rotary agitator extending through its length, and is provided at opposite ends with means for the continuous discharge of hydrofluoric acid gas and solid residue respectively. The retort is enclosed by a flue through which circulate the products of combustion from a furnace at one end of the apparatus.—W. E. F. P.

Aluminium compounds poor in iron; Production of —. Det Norske Aktieselskab for Elektrokemisk Ind. Norsk Industri-Hypotekbank, Christiania, Norway. Eng. Pat. 113,278, 5.2.18. (Appl. 2078/18.) Int. Conv., 6.2.17.

ALUMINOUS minerals, such as plagioclase rocks of the labradorite-anorthite series—in which the bulk of the contained iron is present as a constituent of mineral silicates (hypersthene, diallage, epidote, etc.) less easily decomposed than the plagioclases—are either mixed with carbon and heated to 600° — $1000^\circ C.$, in a current of chlorine or hydrochloric acid, to produce aluminium chloride, which is condensed; or heated to 300° — $600^\circ C.$, in a current of nitrogen oxides and steam, to produce aluminium oxide and sodium and calcium nitrates. In the latter case, the product is treated with water to eliminate the nitrates, and then with a mineral acid to produce an aluminium salt practically free from iron compounds and silicic acid.—W. E. F. P.

Tungstates; Process for obtaining pure — J. B. Ekeley and W. B. Stoddard, Boulder, Colo., U.S.A. Eng. Pat. 122,264, 24.1.18. (Appl. 1391/18.)

To remove phosphorus and arsenic, an aqueous solution of the tungstate is treated successively with an oxidising agent (sodium hypochlorite), a salt of an alkaline-earth metal (magnesium chloride), ammonia, and ammonium chloride, and then filtered.—W. E. F. P.

Felspar, leucite and the like; Treatment of — F. A. Rody, Johnson City, Tenn., Assignor to Metallurgical Co. of America, New York. U.S. Pat. 1,285,796, 26.11.18. Appl., 18.5.15. Renewed 20.7.18.

For the recovery of alkalis and alumina the mineral is treated with a basic alkali compound, and the product is heated to a sintering temperature with an oxygen compound of an alkaline-earth metal, whereby an ortho-silicate of the latter metal is produced, and the alkali and alumina are combined in water-soluble form.—W. E. F. P.

Potassium salt from felspar, etc.; Process of extracting soluble — H. Blumenberg, jun., Assignor to Chemical Construction Co., Los Angeles, Cal. U.S. Pat. 1,286,513, 3.12.18. Appl., 7.11.17.

A mixture of felspar, powdered calcium carbonate, and "acid sludge" is heated in the presence of air to form potassium sulphate and an insoluble calcium aluminium silicate.—W. E. F. P.

Silicates; Method of treating — H. N. Morse, Baltimore, Md. U.S. Pat. 1,286,718, 3.12.18. Appl., 6.4.18.

SILICATES containing potash and alumina and which are attacked by sulphur dioxide are heated in a current of sulphur dioxide to a temperature at which the gas attacks the potash but not the alumina.—J. H. P.

Potash in cement-mill dust; Process for rendering water-soluble the — A. R. Merz, Washington, D.C. U.S. Pat. 1,288,437, 17.12.18. Appl., 19.11.17. (Dedicated to the public.)

PORTLAND cement-mill dust is ignited in an oxidising atmosphere.—W. E. F. P.

Nitrates; Preparation of metal — W. O. Snelling, Long Island City, N.Y. U.S. Pat. 1,285,824, 26.11.18. Appl., 10.5.16.

NITRIC acid is sprayed into a solution of barium sulphide, the mixture being disposed in thin sheets and maintained under reduced pressure.—W. E. F. P.

Nitrates; Production of — from ammonia, ammonium combinations, or organic nitrogen combinations. Process for the production of calcium nitrate. C. T. Thorssell and H. L. R. Lundén, Gottenborg, Sweden. U.S. Pats. (A) 1,286,838 and (B) 1,286,839, 3.12.18. Appl., 10.4.18.

(A) A SOLUTION of calcium nitrate, inoculated with nitrifying bacteria, is applied to a porous mass of calcium carbonate, and the mass is afterwards treated with a dilute solution of a nitrogen compound to be oxidised, and compressed air passed through. (B) Calcium cyanamide, dissolved in water, is mixed with a solution of calcium nitrate, and the mixture brought into intimate contact with nitrifying bacteria, with an ample supply of air, for the production of calcium nitrate.—B. N.

(A and B) **Nitrates; Production of — by means of bacteria.** (C) **Process for oxidising ammonia, ammonium combinations, or organic nitrogen combinations.** C. T. Thorssell and H. L. R. Lundén, Gottenborg, Sweden. U.S. Pats. (A) 1,288,754, (B) 1,288,755, and (C) 1,288,756, 24.12.18. Appl., 10.4.18.

(A) A LIQUOR containing calcium carbonate, calcium nitrate, and ammonium sulphate is inoculated with a nitrifying bacterium which oxidises the ammonia to nitrate, a solution of calcium nitrate resulting. (B) In oxidising ammonium compounds by means of a nitrifying bacterium a suitable inorganic substance is added which has no effect on this bacterium but is poisonous to other bacteria injurious to the reaction. (C) A thin layer of a substratum free from organic nutriment and containing an alkali is placed on a suitable support, inoculated with a nitrifying bacterium, and a liquid containing an ammonium salt is passed through it in presence of air.—B. V. S.

Potassium chloride from saline waters; Process of recovering — G. B. Burnham, Berkeley, Cal. U.S. Pat. 1,286,932, 10.12.18. Appl., 20.12.17.

LIQUOR containing potassium and sodium chloride, sulphate, and carbonate, and approximately saturated with sodium chloride, is cooled to effect separation of sodium sulphate and carbonate, which are removed; and then concentrated by evaporation until separation of sodium chloride occurs and the liquid is approximately saturated with potassium chloride. After separation from the deposited sodium chloride, the warm liquor is cooled to effect crystallisation of the potassium chloride.—W. E. F. P.

Borax and potassium chloride; Process for separating — **Process of obtaining potassium chloride from brines. Process for separating salts from a mixture of salts in solution.** J. W. Hornsey, Summit, N.J., Assignor to General Reduction Gas and By-Products Co. U.S. Pats. (A) 1,288,591, (B) 1,288,592, and (C) 1,288,593, 24.12.18. Appl., 17.4.15.

(A) A SOLUTION containing borax and potassium chloride is diluted to a sp. gr. of 1.12–1.22, e.g., 1.16, at about 200° F. (93° C.), and cooled to about 40° F. (4° C.). Borax is precipitated and is separated from the solution. Subsequent concentration of the liquor at about 200° F., followed by cooling to 40° F., precipitates potassium chloride. (B) To separate potassium chloride from solutions containing potassium chloride, sodium chloride, borax, sodium sulphate, and sodium carbonate, the last-named is precipitated by carbon dioxide, sodium chloride is removed by evaporating the filtrate at an elevated temperature, and borax and potassium chloride are then obtained by cooling the residual liquor. The solution is then subjected to successive evaporations to remove sodium chloride and sulphate, and coolings to remove borax and potassium chloride. The borax and potassium chloride are separated as described under (A). (C) After removing some of the sodium carbonate and chloride, borax, and potassium chloride as described under (B), the solution is re-carbonated to remove the balance of carbonate, and the filtrate is again evaporated to remove sodium chloride and sulphate. The filtrate is mixed with a hot dilute solution of the borax and potassium chloride separated at an earlier stage to produce a solution of sp. gr. 1.12–1.22 at about 200° F., and this is treated as under (A), the final filtrate being returned to the cycle.—S. S. A.

Manganese peroxide; Process of preparing —
M. L. Kaplan, Brooklyn, N.Y. U.S. Pat.
1,287,041, 10.12.18. Appl., 4.8.17.

MANGANOUS nitrate is decomposed in the presence of another nitrate.—W. E. F. P.

Sulphuric acid pickle liquors; Utilisation of —
P. Fireman, Trenton, N.J., Assignor to Magnetic Pigment Co., New York. U.S. Pat. 1,287,939,
17.12.18. Appl., 20.12.17.

FREE sulphuric acid present in the pickle liquor is neutralised and the resulting iron sulphate solution is treated with an alkaline-earth (calcium) chloride, thereby producing a solution of ferrous chloride and a precipitate of calcium sulphate. An alkaline-earth oxide (calcium hydroxide) is then added to the ferrous chloride solution, ferrous hydroxide being precipitated and a solution of calcium chloride formed.—L. A. C.

Titanium hydrates; Process of precipitating —
M. Fladmark, Brettesnes, Assignor to Titan Co. A/S., Christiania, Norway. U.S. Pat. 1,288,865,
24.12.18. Appl., 10.5.17.

THE process consists in heating a concentrated solution containing titanium and iron sulphates in which the proportion of sulphuric acid is less than that required to form normal salts with the bases present.—W. E. F. P.

Sodium sulphide; Process of producing —
E. M. Symmes, Baccus, Utah, Assignor to Hercules Powder Co., Wilmington, Del. U.S. Pat. 1,289,016, 24.12.18. Appl., 9.6.17.

SODIUM sulphate is heated to fusion with carbon in a container of "corrosiron."—W. E. F. P.

Chlorides; Method of dehydrating [rare earth] —
C. W. Balke, Highland Park, Ill., Assignor to Pfansstiehl Co., Inc., North Chicago, Ill. U.S. Pat. 1,289,079, 31.12.18. Appl., 20.9.17.

AMMONIUM chloride is added to a solution of the chloride, the mixture is evaporated to dryness, and the temperature is slowly raised to red heat, in the presence of a current of hydrogen chloride, until all the ammonium chloride has been driven off.—S. S. A.

Sulphur burner. H. C. Ellis, Assignor to Ellis Drier and Elevator Co., Chicago, Ill. U.S. Pat. 1,289,417, 31.12.18. Appl., 19.8.15.

A BURNING chamber of firebrick, having an inlet and an outlet, is supported on a bed of reinforced concrete and enclosed by a brick structure having a roof of reinforced concrete. The two structures are spaced apart to effect insulation and permit expansion of the inner chamber; and the roof and bed of reinforced concrete are connected by tie-rods extending vertically through the outer walls.—W. E. F. P.

Sulphur burning. G. F. Hurt, Assignor to Pratt Engineering and Machine Co., Atlanta, Ga. U.S. Pat. 1,289,785, 31.12.18. Appl., 14.7.17.

AN upward spray of molten sulphur is produced within a burning chamber at the bottom of which a pool of the liquid material is maintained; and the gaseous product, containing a large proportion of sulphur vapour, is conducted into spacious channels to which sufficient air to effect complete oxidation of the sulphur is supplied.—W. E. F. P.

Copper oxide; Manufacture of technical hydrated — free from chlorides. Bayerische A.-G. für chem. u. landwirts.-chem. Fabr. H. Hackl, and H. Bunzel, Heufeld. Ger. Pat. 306,055, 23.3.17. Addition to Ger. Pat. 305,738 (this J., 1918, 467 A).

BASIC copper chloride, precipitated by the addition of strong bases to solutions containing copper, is separated as completely as possible from the liquid, heated under atmospheric pressure with milk of lime or magnesium hydroxide, and washed, the treatment being repeated, if necessary, once or several times.—J. F. B.

Liquefying atmospheric air and separating the same into its constituents, oxygen and nitrogen: Apparatus and process for — J. F. Place, Essex, N.J., U.S.A. Eng. Pat. 122,212, 5.11.17. (Appl. 16.147/17.)

IN an apparatus having a number of pressure-regulating valves consecutively arranged, each valve has a high- and a low-pressure port and is connected with an expansion chamber within which a high-pressure feed-pipe or coil is disposed. Each of the feed-pipes is supplied with compressed air from the preceding expansion chamber, and delivers to the high-pressure port of the valve connected with its own chamber; and the low-pressure port of each valve discharges into its own expansion chamber through a space immediately surrounding the high-pressure feed-pipe. The compressed air admitted to the high-pressure port of each valve is thus cooled by the partially expanded air delivered from the low-pressure port of the same valve.—W. E. F. P.

Hydrogen purifying, cleaning, and circulating system. C. A. Pfansstiehl, Waukegan, Assignor to Pfansstiehl Co., Inc., North Chicago, Ill. U.S. Pat. 1,286,088, 26.11.18. Appl., 26.4.15.

IN a circulating system for drying and purifying hydrogen, the impure gas, containing a trace of free oxygen, is delivered to a supply reservoir in which a constant pressure is maintained, and the oxygen is removed by means of a heated reagent in a de-oxidising chamber connected in series with the supply reservoir and a circulating pump.—W. E. F. P.

Nitrogen; Production of — M. Shoeld, Assignor to Armour Fertilizer Works, Chicago, Ill. U.S. Pat. 1,287,472, 10.12.18. Appl., 6.3.18.

FROM a mixture of nitrogen and carbon dioxide, the latter is removed by means of an aqueous solution which is afterwards boiled to recover the carbon dioxide and regenerate the absorbent. The hot liquid is utilised for preheating a further quantity of solution already charged with carbon dioxide.—W. E. F. P.

Acetic acid; Manufacture of — *Manufacture of acetic acid from acetaldehyde.* H. Dreyfus, Basle, Switzerland. U.S. Pat. 1,286,255 and 1,286,256, 3.12.18. Appl., 1.6 and 4.6.17.

SEE Eng. Pat. 105,065 and 108,450 of 1917; this J., 1918, 180 A, 266 A.

Hydrogen; Producing — H. Keller, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,286,650, 3.12.18. Appl., 19.4.13.

SEE Fr. Pat. 453,077 of 1913; this J., 1913, 791.

Nitrogen and carbon dioxide; Apparatus for making — C. D. McCourt, London, and C. Ellis, Montclair, N.J., Assignors to Surface Combustion, Inc., Wilmington, Del. U.S. Pat. 1,289,496, 31.12.18. Appl., 26.1.12. Renewed 18.5.18.

See Eng. Pat. 25,629 of 1912; this J., 1913, 751.

Waste flux from galvanising. Eng. Pat. 121,954. See X.

Recovering potash salts. Eng. Pat. 122,048. See X.

Electrolytic apparatus. U.S. Pat. 1,287,156. See XI.

VIII.—GLASS; CERAMICS.

Silica bricks and their manufacture. L. Dauphin. Bull. Soc. de l'Ind. Min., 1918, 13, 137—190.

TRICAL silica bricks of best quality and medium quality respectively have the following properties: Refractoriness (T), 1750° C.; 1730° C.; refractoriness after adding 6% Fe₂O₃ (t), 1735° C., 1710° C.; true sp. gr., 2.35, 2.47; porosity, 18%, 20%. The durability of the brick is a function of T and t; no brick should have T less than 1730° C. and t less than 1710° C. The porosity should not usually be less than 18%. The value 2.47 for the true sp. gr. may be regarded as a strict maximum. The refractoriness test should be made on the ground sample, moistened with dextrin solution and then made into small tetrahedrons. When silica bricks are ground with 6% of ferric oxide the refractoriness is reduced by 15°—50° C. The effect of iron oxide is much more marked if sufficient lime has previously been added to reduce the refractoriness to a definite figure. Alumina is very harmful in silica bricks. In one case it was found that the addition of 1.5% of alumina in the presence of lime greatly reduced the refractoriness. The proportion of lime used should not exceed 2%. Bricks containing 3% of lime,

mixed by hand, are not as strong as those containing only 1% of lime which have been tempered in an edge-runner mill. The milk of lime should be prepared at least 5 hours and preferably 24 hours before it is required, and unslaked pieces should be removed by passing the milk through a 25-mesh sieve. Mechanically hydrated lime in the form of a fine powder is preferable to milk of lime. The best material for silica bricks is a very pure quartzite which does not crack on heating. When this is unobtainable a quartz which cracks moderately should be used. Rock which contains veins of quartz or other intrusions should be rejected. The rock should be crushed until it passes completely through an 8- or 10-mesh sieve. The crushed material should also be carefully graded. The larger grains of silica rock (7—10 mm.) should not crack or fall to pieces when heated. All forms of silica are equally good if they are sufficiently pure and the rock is of sufficiently fine grain. Bricks made of such materials have also high porosity. Sand is usually unsuitable for the manufacture of silica bricks because it produces bricks of too great a porosity and too low a strength, but if a portion of the sand is ground so fine that it passes wholly through a 50-mesh sieve and half of it passes through a 200-mesh sieve, it may be used quite satisfactorily, provided the sand is sufficiently pure. The greater the pressure used in shaping the bricks the stronger are the bricks and the smaller is the loss in manufacture. The soft pastes used in England do not give the densest bricks. By using a stiffer paste and a powerful press (400 kilos. per sq. cm.) better and denser bricks are produced. In burning the bricks the smallest particles of silica are transformed the most readily into cristobalite and tridymite; impure quartzites—particularly those containing a little alumina—are most difficult to transform. The most suitable kilns are the downward draught type in which the bricks are set in benches 9 in. wide, placed 2½ to 4 in. apart, but continuous kilns appear to give almost equally good results, and the saving of fuel effected by them is very considerable. The heating should occupy at least 72 hours per chamber. A comparison of British and foreign silica bricks gave the following results:—

	Refractori- ness	True sp.gr.	Poros- ity %						Refractori- ness after adding 6%
				SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Fe ₂ O ₃
<i>British bricks:</i>									
B.W.	1725° C.	2.44	24	94.3	1.40	1.66	2.30	—	—
B.A.Y.D.	1733° C.	2.36	25	95.0	0.87	2.03	2.00	—	—
B.S.Y.D.	1710° C.	2.33	26	95.0	1.17	1.33	2.20	—	—
B.F.P.	1735° C.	2.43	32	95.6	0.68	2.22	1.30	—	—
B.B.	1725° C.	2.53	28	98.9	0.86	1.84	3.0	—	—
<i>German bricks:</i>									
Zurbig	1728° C.	2.30	23	95.1	1.53	0.97	2.0	—	—
Stella	1730° C.	2.47	20	95.9	0.41	1.87	1.7	—	—
<i>French bricks:</i>									
Loire	1725° C.	2.34	31	95.48	1.86	—	1.78	traces	1715° C.
"	1725° C.	2.56	28	96.46	1.18	—	2.06	—	1700° C.
S.A.M.	1715° C.	2.35	27	93.82	1.12	2.54	1.78	—	—
C.F.D.	1750° C.	2.35	17	96.15	0.37	1.24	1.75	0.18	1735° C.
<i>American brick:</i>									
"Star"	1730° C.	2.31	30	97.8	0.9	0.85	0.10	0.15	1710° C.

—A. B. S.

Silica refractories. N. Parravano. Annali Chim. Appl., 1918, 10, 150—158.

SLIGHT variations in the conditions of burning silica bricks may have a pronounced effect upon the porosity of the product and its mechanical resistance. Thus while the chemical composition may be the same the resistance to compression may vary from 1 to 10. Slow heating and cooling are necessary to obviate the effect of the changes in volume. The two methods of transforming the quartz into cristobalite and tridymite (i.e. with or without the use of a flux) produce different effects. The crystallisation of the flux does not cause expansion, since the new crystals are deposited in the free

spaces, whilst, on the other hand, the change which takes place in the absence of a flux promotes expansion of the granules owing to the diminution in density which accompanies it. Silica bricks made by the ordinary method consist principally of cristobalite (70%) and a little tridymite (5%). On continuing the burning the proportion of tridymite continually increases until, after 20 days' continuous heating, the whole mass becomes tridymite. Bricks insufficiently burned give unsatisfactory results, since they are not yet converted into a continuous block, and the quartz granules at a high temperature are isolated and suspended in a liquid. The material is therefore plastic as in the case of re-

fractory materials of clay and magnesia. Successful welding of the quartz granules depends upon the quantity of flux, the temperature of burning, and the size of the granules. The flux has a great influence on the capacity of the refractory material to resist the effect of a high temperature. This is owing to the fact that the solubility of the silica in the flux increases with the temperature, and that the block thus has a tendency to disintegrate. Hence, the higher the temperature to which the refractory material is to be subjected the smaller should be the proportion of flux used. Experience has shown that for refractories for steel furnaces the proportion of foreign oxides should not exceed 3 to 5%, whilst in the case of those for coke ovens twice as much may be used. The temperature of burning should be such that the flux becomes a mobile fluid; the most suitable temperature appears to be about 1400° C. Since fine granules of quartz dissolve most readily they should be present in the largest proportion, but it is necessary also to have a certain amount of coarse granules, since fissures spread too readily in a mass composed of uniformly fine granules. To prevent the formation of fissures the burned refractory material should not contain unaltered quartz granules. Refractories in which the granules are thoroughly welded should show a resistance to compression equal to at least 10 kilos. per sq. cm., after being heated for an hour at 1600° C. (See also this J., 1917, 964; 1918, 546 A, 695 A.)—C. A. M.

Silica refractories for glassworks use. W. J. Rees. J. Soc. Glass Tech., 1918, 2, 253—259.

SILICA bricks are preferred to fireclay bricks in the crowns of glass furnaces because they expand and are less likely to allow the crown to fall and because pieces which fall from them into the molten glass are readily soluble in the latter and do not form "stones." Ganalster is more readily inverted than most silica rocks, and is therefore very suitable for silica bricks. The use of 25% of the silica in an impalpable form is recommended. The texture of the bricks should be uniform; bricks with a fine texture resist hot gases and fluxes better than coarse-grained bricks. For glass works, bricks of medium texture and containing no particles larger than $\frac{1}{4}$ in. diam. are preferable. Owing to expansion and contraction accompanying the inversion of the silica during the heating and cooling of the furnaces, the tie-rods should be released or tightened as may be required. The bricks should be laid dry and the cement applied as grouting. To test the cement a thin layer should be placed between two bricks and when dry, the bricks should be heated to a temperature well above that at which they will be used. A good cement should be only slightly less refractory than the bricks (not more than 2 cones lower). A good cement may be made by grinding those portions of used silica bricks which have not been in contact with fluxes, or by grinding a high quality silica rock with not more than 6% of fireclay.—A. B. S.

Refractory materials and the glass industry. J. W. Cobb. J. Soc. Glass Tech., 1918, 2, 262—272.

THE maximum temperature reached in the glass industry is 1400° C., except in certain tank furnaces which are worked at a higher temperature to secure high output. In addition to the corrosive effect of the molten glass on the pots or tanks, the bricks in the furnace have to withstand the action of mechanically carried dust and of volatilised matter. Most of the refractory materials used in the glass industry are composed of fireclay or silica, or mixtures of these. When finely ground silica is added to finely ground alumina the melting point is steadily reduced from cone 42 to cone 29 (1650° C.) for a mixture of 8 mols. SiO_2 to 1 mol. Al_2O_3 , which

is the same ratio as that in a very good and widely used brick. The anomaly is due to the material in the bricks being coarse-grained, so that the interaction between the silica and alumina is not so complete as in finely ground material. In mixtures of equal weights of fine fireclay and silica fragments of different selected sizes, heated under laboratory conditions, the silica did not begin to act as a flux unless the fragments were less than 0.0025 in. diameter. Larger fragments act as a stiffening agent and increase refractoriness, but when exposed for a week in a works furnace at 1500° C. all the silica fragments less than 0.025 in. diameter exercised a definite fluxing effect. On substituting pitch for fireclay (so as to eliminate the solvent action of the fireclay on the coarse silica), it was found that the addition of silica always had a stiffening action, the most marked effect being with fine material which had passed through a 100-mesh sieve. Hence, the greater stiffening effect of the coarse fragments in silica-fireclay mixtures is due to their greater resistance to solvent-action by the fireclay. There is an upper limit to the size of silica fragments which is permissible in bricks which depends upon the mechanical strength of the fragments and the local expansion of the silica. The proportion of clay which can be used in a mixture is limited by its shrinkage when the bricks are in use. Excessive shrinkage causes wide cracks into which liquids and vapours may penetrate and cause corrosion. Excessive expansion causes distortion and "crushing." If an alkaline vapour attacks a clay surface in such a manner as to form a molten silicate immediately, the latter soon closes the pores and the subsequent fluxing action is low. If the attack occurs at a lower temperature than that at which much fusion can occur, the vapour penetrates the brick or block and a complicated action of a destructive character may occur (see this J., 1910, 69, 250, 335, 390, 608, 799, 1091). If the temperature is afterwards increased the vitrified mass produced is liable to disintegrate. If crystallisation occurs the disintegrating effect will be still greater. The cement used in laying refractory bricks and blocks should be very fine grained so as to allow joints of minimum thickness.—A. B. S.

Optical glass; The presence of iron in the furnace atmosphere as a source of colour in the manufacture of —. E. W. Washburn. J. Amer. Ceram. Soc., 1918, 1, 637—639.

AN optical glass melted in an electric furnace was free from colour whilst the same batch when melted in a gas-fired furnace was distinctly green. The colour was traced to the presence of iron in the gases constituting the furnace atmosphere. A sample of glass withdrawn previous to stirring was much less coloured than the finished glass. After replacing the iron gas-burners by others made from clay and coating the interior walls of the furnace with kaolin, a distinct reduction in the colour of the glass was obtained. The kaolin on the walls gradually acquired a red colour due to absorption of iron either from the bricks or from the furnace atmosphere. It is desirable to use iron-free bricks for lining the furnaces, and any metallic iron used in the interior of the furnace should be water-cooled to prevent volatilisation of the metal.

—A. B. S.

Glass-house pots; Requirements of clay for —. S. N. Jenkinson. J. Soc. Glass Tech., 1918, 2, 272—280.

THE following provisional specifications for clays for glass-house pots are suggested. Clay mixtures for pots should consist of bind clay, base clay, and grog. The bind clay should be a fat aluminous weathered clay of low sintering point so that vitrification will

start early, but the clay must not show signs of over-firing until high temperatures are reached. The refractoriness under load is of secondary importance. The grains should be very small. The base clay should be a highly aluminous refractory clay in specially selected lumps as free as possible from pyrites. Freedom from iron in segregated form is necessary. Fine grinding is important. The more angular the grains the better. The grog should have been prepared from specially selected lumps of clay calcined at 1250° C. or above, and with no signs of "blue stoning" or black cores. Ground firebrick should not be used as grog. The grog is used to form a skeleton of shrunk clay and to delay over-firing. It must be fully shrunk, and well graded, preferably with a considerable proportion of flour with angular grains. None of the clays when fired in a slightly reducing atmosphere at 1400° C. should show signs of speckling, but should have a dense structure. A wide range of vitrification (1140°–1450° C.) is necessary, especially in the bind clay. Three grades of each clay are suggested as shown in the following table:—

	GRADE I.			GRADE II.			GRADE III.		
	Bind clay	Base clay	Grog	Bind clay	Base clay	Grog	Bind clay	Base clay	Grog
*Silica %	60 (a)	55 (a)	50 (a)	65 (a)	60 (a)	60 (a)	70 (a)	70 (a)	70 (a)
*Alumina %	34 (b)	40 (b)	40 (a)	30 (b)	35 (b)	35 (b)	25 (b)	25 (b)	25 (b)
*Ferric oxide % ..	1.8 (a)	1 (a)	1 (a)	2 (a)	2 (a)	2 (a)	2.5 (a)	2 (a)	2 (a)
*Na ₂ O and K ₂ O % ..	1.8 (a)	1.5 (a)	1.5 (a)	2 (a)	1.8 (a)	1.8 (a)	2.5 (a)	1.8 (a)	1.8 (a)
*MgO and CaO % ..	1.0 (a)	0.5 (a)	0.5 (a)	1 (a)	0.6 (a)	0.6 (a)	1.0 (a)	1.0 (a)	1.0 (a)
Refractoriness (cone) ..	32	35	35	30	32	32	28–29	30–31	31
Ground to	80 mesh	80 mesh	10 mesh	50 mesh	50 mesh	10 mesh	12 mesh	12 mesh	10 mesh
Calcining temperature (cone) ..	—	—	11 (b)	—	—	12 (b)	—	—	9 (b)

* = Determined in the fired samples.

(a) = and under.

(b) = and over.

(c) = When blunged it must not leave more than 10 per cent. residue on a 50-mesh sieve.

(d) = When blunged it must not leave more than 10 per cent. residue on a 80-mesh sieve.

It is necessary to select the clays to suit the temperature of the furnace, as it is essential that the pots shall be well vitrified before use.—A. B. S.

[Glass] pot attack; Notes on —. E. A. Coad-Pryor. J. Soc. Glass Tech., 1918, 2, 285–287.

Small pots of 100 grms. capacity and rods of $\frac{1}{2}$ in. diameter of the same material were fired at different temperatures and the thickness of the bottoms of the pots and the diameters of the rods were measured. The rods were suspended vertically with their lower end $\frac{1}{2}$ in. above the bottom of the inside of the pots. The pots were then filled with cullet and the latter melted in an electric furnace at a controlled temperature. The bottom of the pot was invariably attacked more than the sides and the rod was always tapered. The effect of porosity in well-fired pots was not large. The protection of the sides of the pot appears to be due to the formation of sillimanite. With a refractory material denser than clay the corroded rod has a smaller diameter near the surface of the glass than lower down. This is the characteristic of all materials in the process of solution whereas abrasion produces a taper with the thin end downwards. The phenomena are attributed to currents set up during the process of solution, these currents depending on the relative densities of the molten glass, the refractory material, and the solution.—A. B. S.

Glass pots; Apparent causes of failure of lead —. A. F. Gorton. J. Amer. Ceram. Soc., 1919, 1, 648–659.

The chief causes of failure in pots used for melting lead glasses are cracking and corrosion. Cracks may be produced by strains set up by heating the pot-arch too rapidly, by not preheating sufficiently, and by throwing the glass batch into the pots.

Corrosion may be due to the slagging action of iron on the clay, to solution of the pot material following the action of alkalis and glass, and to insufficient burning of the bottom of the pot in the pot-arch. The last-named defect could be obviated by allowing the pot to remain empty in the furnace for three days. The vitreous layer formed by heating the inner surface of the pot with a burner or by molten glass is too thin to protect the pot sufficiently. A lining of aluminous or porcelain-like material is liable to crack and spall. The safest method is to burn the pot thoroughly at a temperature of 2500° F. (1380° C.) the heat being applied directly to the bottom. The addition of porcelain grog to the pot batch is of little use and tends to cause the sides to bulge.—A. B. S.

Glass; Solubility of clay in —. J. H. Davidson and W. E. S. Turner. J. Soc. Glass Tech., 1918, 2, 280–284.

Ground samples of clays, burned at various temperatures, were mixed with a standard glass batch and the time taken to dissolve the clay at a definite

temperature was noted. It was found that finely ground clay even when fired at 1450° C. is readily soluble in soft glass batch at 1350°–1400° C., the rate of solution depending on the size of the particles. It is therefore desirable to subject the part of the pot or block exposed to the glass to hard firing before use so as to close the pores or cracks and thus reduce the surface area. The pots may also be made with a smooth surface, for example, by using Weber's casting process.—A. B. S.

Glass; Identification of "stones" in —. N. I. Bowen. J. Amer. Ceram. Soc., 1918, 1, 594–605.

A CHEMICAL analysis of "stones" in glass is unsatisfactory on account of the small amount of material available, but their nature may be rapidly ascertained by crushing them, and determining their refractive index, extinction angle, and other optical properties under the microscope. "Pot stones" are detached fragments of the vessel in which the glass has been melted. Under the microscope they show crystals of sillimanite (Al_2SiO_5) with a little interstitial glass. Sillimanite is never found in "stones" of other origin. "Pot stones" may be avoided by more carefully preheating the pots, by using pots of more uniform texture or of more suitable composition, by altering the glass batch so as to reduce its action on the pots, and by melting at a lower temperature. "Batch stones" are particles of unmelted material from the glass batch and consist wholly of silica, sometimes in the form of the original quartz (sand), with or without a coating of cristobalite or tridymite; sometimes in the form of cristobalite or tridymite without interstitial glass. "Batch stones" frequently have a "tail" of glass of lower refractive index due to the gradual solution of the silica of the "stone"; these

"tails" are absent in "stones" caused by devitrification. To prevent the formation of "batch stones," the glass should be melted at a higher temperature or more fluxes should be added, finer or more uniform sand should be used, and the batch materials should be better mixed. Occasionally, adventitious materials in the batch cause "batch stones"; these may be sometimes identified under the microscope. "Crown drops" are fragments detached from the brickwork in the crown of the furnace or are drops of material formed by the action of vapours on the brickwork. When silica bricks are used the "drops" usually consist mainly of tridymite in relatively large crystals, which are readily distinguished from "batch stones." In cases of doubt a comparison with pieces of the glaze chipped from the brickwork should be made. "Devitrification stones" are opaque masses containing 10–15% of crystals formed by the devitrification of the glass, and analogous to the spherulites which occur in volcanic lavas. The crystals are composed of:—(a) principally tridymite, but cristobalite is usually present; (b) wollastonite (CaSiO_3) fibres, sometimes with cristobalite; (c) other silicates such as BaSi_2O_6 , PbSiO_3 . "Devitrification stones" differ from "batch stones" in having no central core of dense crystalline nature free from glass, and no core of quartz. The nature of the compound separating from the glass suggests which of the raw materials is probably at fault or the change in the composition of the batch which should be made. The optical properties of the above-mentioned substances are briefly described.—A. B. S.

Boric oxide in glass; Determination of — J. D. Cauwood and T. E. Wilson. *J. Soc. Glass Tech.*, 1918, 2, 246–252.

The most easy, rapid and satisfactory method for determining boric oxide in glass is Sullivan and Taylor's modification of Wherry's method (this J., 1914, 1154). Wherry's method (this J., 1908, 1179) gives high results with glasses containing lead or zinc, but is satisfactory for glasses free from these metals. The glass apparatus used should not contain boric oxide. The volume of the solution should be kept as low as possible consistent with thorough washing, and if Wherry's method is used the boiling with calcium carbonate should not be unduly prolonged. The volume of the solution titrated may be as high as 300 c.c. if sufficient mannitol is present.—A. B. S.

Glass; Effect of temperature on the rate of corrosion of — J. D. Cauwood and W. E. S. Turner. *J. Soc. Glass Tech.*, 1918, 2, 260–262.

FLASKS of different types of glass previously examined (this J., 1917, 873; 1918, 692A) containing various reagents were heated in a thermostat to carefully regulated temperatures between 60° and 100° C. for varying periods; in every case the corrosion of the glass increased rapidly with a rise in temperature. With water the amount of material dissolved was doubled for each rise of 5° C. between 90° C. and 100° C., except in one case in which the loss at 100° C. was four times that at 95° C. With 2N Na_2CO_3 the action was roughly doubled for each 10° rise between 60° C. and 100° C. With 20% hydrochloric acid the rate of increase in chemical action with temperature was distinctly less than with water and alkali.—A. B. S.

Porcelain; Some types of — F. H. Riddle and W. W. McDanel. *J. Amer. Ceram. Soc.*, 1918, 1, 606–627.

A STUDY of the burning range of porcelain bodies composed of varying proportions of kaolin, feldspar, and flint with a constant proportion (15%) of whit-

ing, burned at or above cone 10, including electric insulators, hotel china, chemical porcelain, and some domestic china. The materials, in the desired proportions, were ground wet in a ball mill, passed through a 140-mesh silk lawn, filter-pressed, and the cakes hand-wedged and made up into trial pieces and standard cups three days later. The effect of increasing the feldspar was to reduce the porosity without greatly altering the burning range. There was very little difference in the softening points of bodies with from 45 to 70% of kaolin and from 12½ to 30% of feldspar; there was more difference between bodies containing from 12½ to 30% of feldspar with 45% of clay than in similar mixtures with 70% of clay. The shrinkage-temperature graph was parabolic. The higher the proportion of clay the less was the effect of variations in the proportion of flux. Bodies containing 45–50% of clay vitrified at a slightly higher temperature than those with 55–60% of clay, but also containing 1.5% of whiting. When the damp body was kept for eight months its strength increased, the "aged" bodies in which the whole of the clay was kaolin being stronger than fresh bodies containing 16% of ball clay. Difficult shapes can be made much more easily from "aged" than from fresh bodies and a smaller proportion of ball clay can be used, thus enabling a whiter product to be made. Ball clay tended to reduce the porosity and to cause the ware to be over-burned, but was sometimes useful in permitting a reduction in the feldspar content. At higher temperature the "aged" bodies shrank less and had less porosity than the fresh ones and the ware was burned more uniformly. Ball clay reduced the burning range and should therefore be kept at a minimum in bodies which can be improved by storage. The addition of 0.2–1.0% of magnesia, lime or barium carbonate to a typical hard paste porcelain body showed that barium oxide only reduced the porosity slightly, but magnesia caused the body to mature earlier and caused over-burning at a lower temperature. Lime did not hasten the maturing of a body, but caused over-burning at a lower temperature and shortened the burning range. A mixture of magnesium and calcium carbonates in molecular proportions behaved like magnesia alone. The translucency of the ware was increased by the addition of lime or magnesia up to 1%, but not by baryta. Hence the addition of a little magnesite or dolomite to a porcelain body should be better than that of whiting. The shrinkage was greater in the presence of magnesia and dolomite than in that of lime. Sillimanite was prepared by calcining a mixture of kaolin and anhydrous alumina with 20% of boric acid at cone 20, grinding the product, and passing it through a 100-mesh sieve. A body in which this material replaced the flint was made of sillimanite calcine 22.5%, kaolin 51.0%, feldspar 25%, and whiting 1.5%. It had a long range of vitrification, was free from the strains resulting from the volume changes due to the conversion of quartz into other forms of silica and had a low coefficient of expansion. The kaolin-alumina mixture may also be incorporated with the flux, making it possible to reduce the temperature of calcination to cone 14. Dolomite can be used in bodies for hotel china, for which the following limits of composition for a burning range of cones 10–12 are suggested: flint, 30 to 40%; feldspar, 14 to 18%; alkaline-earth fluxes, 4 to 0.5%; ball clay, 3 to 8%; china clay, 45 to 25%; Florida clay, 10 to 6%. When very white porcelain is required it may be secured by the use of very pure materials, by burning under oxidising conditions to cone 09 and under reducing conditions from 09 to 8, and by the use of a blue stain such as basic cobalt carbonate. The use of small proportions of dolomite, magnesite, or whiting also improves the whiteness of the ware.

—A. B. S.

Porcelain; Electrical resistance of — at different temperatures. R. G. Allen. Sci. Proc. Roy. Dublin Soc., 1918, 15, 289—309.

THE electrical resistance of various samples of porcelain was measured at various temperatures, between 80° C. and 300° C. The samples examined were: (a) (b) Two low-tension porcelain insulators for transmission wires, of thickness 0.7 cm., 0.65 cm. respectively; (c) an old porcelain insulator (date 1862), 0.65 cm. thick; (d) an evaporating dish of German make, 0.22 cm. thick; (e) a long Berlin porcelain tube, 0.8 cm. internal and 1.1 cm. external diameter; (f) a porcelain crucible lid of German make, 0.16 cm. thick; (g) a bowl of Portland china, 0.22 cm. thick; and (h) an evaporating dish of Royal Worcester porcelain, 0.16 cm. thick. In each case, except the inner surface of the tube, the samples were glazed. The results confirm the approximate truth of Rasch and Hinrichsen's formula (Z. Elektrochem., 1908, 14, 41):—

$$\log \sigma = \frac{a}{T} + b,$$

in which σ is the specific insulation resistance, T is the absolute temperature, and a and b are constants for a given material. For temperatures below 250° C. the insulation resistance of porcelain is frequently independent of the voltage, but porcelains of different varieties show great differences in resistance. Approximate values for the insulation resistance in megohms per cm. cube of the samples examined, at ordinary temperatures, are given in the following table:—

Sample	10° C.	20° C.	30° C.	40° C.
<i>g</i>	500,000 × 10 ⁶	126,000 × 10 ⁶	25,500 × 10 ⁶	10,600 × 10 ⁶
<i>h</i>	200,000 "	71,000 "	17,800 "	6,300 "
<i>d</i> and <i>e</i>	11,200 "	3,200 "	850 "	250 "
<i>g</i> and <i>c</i>	3,980 "	1,260 "	397 "	158 "
<i>a</i> and <i>b</i>	1,590 "	446 "	129 "	40 "

The high electrical resistance of Portland china and Royal Worcester chemical porcelain is noteworthy.—A. B. S.

Enamels; Control of the lustre of —. H. F. Staley. J. Amer. Ceram. Soc., 1918, 1, 640—647.

For enamelling metal, enamels with a bright finish are required, and they must not crystallise under

normal conditions of working and use. The simplest method of preventing this is to use an enamel highly viscous at the temperature at which crystallisation occurs, and to cool rapidly. Silica and silicates high in silica melt to viscous glasses, so that the addition of silica or felspar to an enamel will lessen the tendency to crystallisation, but the maturing temperature of the mixture will usually be raised beyond working limits. Boric oxide forms a very viscous glass at low temperatures, but the viscosity decreases rapidly as the temperature increases. Borate glasses become more viscous as the percentage of boric acid increases, but the viscosity decreases as the temperature increases. The presence of eutectic and other compounds has no noticeable effect on the viscosity curves. Kaolin and opacifiers increase the viscosity of enamels, and a reduction in the proportions of any of the fluxing metallic oxides has the same effect. Hence the proportion of all fluxes except boric and lead oxides should be kept low, and a large variety of such oxides used so as to limit the concentration of any one of them. Partial cooling and re-heating of the enamelled ware should be avoided. Sulphur in the materials composing the enamel batch is not likely to be harmful, but the saturation of a thin film of enamel by sulphur from the kiln atmosphere may cause "feathering." This defect occurs chiefly in badly ventilated muffles, in those with cracked floors, and in open-arch or semi-muffles in which there is not sufficient draught to cause the flame to "hug the roof." The use of quicklime inside the muffle is seldom effective; it is most so when it is piled over temporary patches in the floor of the muffle, but it must be renewed daily as soon as it becomes saturated. Mixtures containing lead, barium, and zinc oxides tend to produce enamels of great brilliance. Potash gives greater brilliancy than soda, and boric acid than silica. Enamels rich in flint are usually more brilliant than those in which felspar is the only refractory.—A. B. S.

Silicate specific heats. W. P. White. Amer. J. Sci., 1919, 47, 1—43.

THE specific heats of various silicates were determined by the method used in an earlier investigation (this J., 1909, 1127), improved in various details so as to obtain increased accuracy (see page 158 A). The following results were obtained:—

		Interval specific heats.							
		0°–100° C.	0°–300° C.	0°–500° C.	0°–700° C.	0°–900° C.	0°–1100° C.	0°–1300° C.	0°–1400° C.
<i>Crystals:</i>									
Quartz	..	0.187	0.217	0.238	0.254	0.260	0.264	—	—
Pseudo-wollastonite	..	0.184	0.204	0.217	—	—	0.238	0.243	0.245
Cristobalite	..	0.188	0.233	0.243	0.251	0.257	0.262	0.266	0.268
Anorthite	..	0.190	0.214	0.230	0.240	0.248	0.255	0.263	0.267
Andesine	..	0.192	—	0.233	0.244	0.252	—	—	—
Microcline	..	0.187	0.211	(0.226)	0.237	0.245	(0.251)	0.116	0.125
Wollastonite	..	—	—	—	0.227	0.234	0.240	0.242	—
Diopside	..	0.192	0.216	0.231	0.242	0.250	0.256	—	0.260
Amphibole	..	0.203	0.230	0.246	0.258	0.266	0.273	—	—
Pyroxene	..	0.204	0.231	0.249	—	—	—	—	—
<i>Glasses:</i>									
Silica	..	0.185	0.212	0.230	0.242	0.251	—	—	—
Anorthite	..	0.188	0.215	0.230	0.240	—	—	—	—
Andesine	..	0.193	0.221	—	0.248	(0.262)	—	—	—
Albite	..	0.198	0.224	0.241	—	0.264	—	—	—
Microcline	..	0.192	0.216	0.232	0.243	0.251	0.260	—	—
Wollastonite	..	0.185	0.208	0.221	0.235	—	—	—	—
Diopside	..	0.193	0.219	0.233	0.244	—	—	—	—
Mag.-silicate	..	0.204	0.230	0.247	0.260	—	—	—	—

For quartz and silica glass, the values of the interval specific heats satisfy the expressions:—

$$\text{Quartz} \dots 0.1685 + 0.000194\theta - 0.00000116\theta^2$$

$$\text{Silica} \dots 0.1676 + 0.000189\theta - 0.00000125\theta^2$$

The true atomic heats rise regularly from about

3.5 at 0° C. to about 5.96 (with anorthite to 6.6) at 1300° C. On comparing the specific heats of various silicates in the crystalline and glassy form respectively, it was found that the specific heat of the glass is seldom greater than that of the crystal, the exceptions being the glasses containing sodium

or potassium. Some glasses show a decided increase in specific heat at a fairly elevated temperature. The specific heat of anorthite glass is much less than that of the crystal. At 1300° C. magnesium metasilicate (amphibole) undergoes a monotropic inversion with evolution of heat. This unstable form has a specific heat more than 1% below the other. At 1170° C. wollastonite (calcium metasilicate) undergoes an enantiotropic inversion into pseudo-wollastonite with absorption of heat, the product having a lower specific heat. The reversion on cooling does not occur without a solvent. Neither form shows any perceptible irregularity in its specific heat near the temperature of inversion. At 575° C., quartz undergoes a sharp reversible inversion from α - to β -quartz with an increase in volume and changes in most of its optical properties. The specific heat largely follows these other changes, but, if the effect of the expansion on the specific heat is calculated, the increase in specific heat is more than four times too small to account for the work demanded by the expansion. The relatively high specific heat of cristobalite at 100° C. indicates that the α - to β -cristobalite inversion is of the same type as that of quartz at 575° C. The transformations of quartz into cristobalite and tridymite resemble the inversion of wollastonite into pseudo-wollastonite rather than the prompt change from α - to β -quartz. The former are accompanied by negligible changes in the specific heat, whereas in the latter the change is strongly marked. It is suggested that in the change from α - to β -quartz, and from α - to β -cristobalite, the crystal changes *en masse*, involving a stretching rather than a re-arrangement of the atomic pattern, whilst in the wollastonite—pseudo-wollastonite and quartz—cristobalite inversions there is no general shifting, but the new crystals grow at the expense of the old ones, as they might grow in glass, but more slowly. When a substance occurs in two or more forms, none of them shows any variation in the specific heat near the inversion temperature. (See also J. Chem. Soc., Feb., 1919.)—A. B. S.

Zirconia; its utilisation as a refractory, opacifier, and abrasive. A. Granger. *Monit. Scient.*, 1919, 9, 5—14.

An account is given of the most important published researches on Brazilian zirconia, its purification, and utilisation for the manufacture of refractory ware. For his own experiments the author prepared zirconia from zircon. The mineral was first extracted with hydrochloric acid to remove iron, and converted into sulphate by treatment with hot concentrated sulphuric acid, the zirconia being precipitated as hydroxide or basic sulphate after removal of the silica. The zirconia obtained by ignition of the hydroxide was moulded into crucibles in a press, an organic binding material being used. The firing temperature employed is not given, but it is claimed that good results were obtained when the zirconia had previously been strongly ignited. Attempts to prepare zirconia tubes for use in a carbon resistance furnace were not successful, because at high temperatures the zirconia itself becomes a good conductor. The author does not consider that zirconia is likely to displace stannic oxide in enamels on account of the high cost of iron-free zirconia, although possibly it may find application for special acid-resisting enamels. Zircon may be used as an abrasive for certain purposes.—E. H. R.

PATENTS.

Glass; Method of delivering — from furnaces. G. E. Howard, Butler, Pa., U.S.A. Eng. Pat. 122,258, 21.1.18. (Appl. 1186/18.)

The glass is passed from the melting tank through a small passage into a delivering chamber during

a comparatively long interval of time, and is then discharged through a larger opening and hence at a faster rate by lowering one or more displacing blocks of refractory material into the glass in the delivery chamber. When refilling the delivery chamber the displacement blocks are not raised clear of the surface of the glass.—A. B. S.

Glass-furnace. A. L. Schram, Hillsboro, Ill., Assignor to Drey Automatic Glass Machine Co., St. Louis, Mo. U.S. Pat. 1,288,227, 17.12.18. Appl., 15.4.15.

A device for delivering glass from a glass furnace comprises an adjustable plug in a sectional fireproof hood mounted on a metal framework adjacent to the discharge outlet of the furnace.—A. B. S.

Glass-annealing oven. J. M. Lents, Evansville, Ind., Assignor to The Owens Bottle Machine Co., Toledo, Ohio. U.S. Pat. 1,289,208, 31.12.18. Appl., 19.5.16.

The glass is carried through the lehr by a continuously moving conveyor. A loading conveyor passes through the wall above the lehr conveyor, and inside the lehr is enclosed in a casing, from which a smooth surface extends and rests on the lehr conveyor. Means are provided for pushing the ware from the loading conveyor on to the smooth surface at intervals, and for preventing the passage of ware into the lehr whilst the pushing movement is in operation.—A. B. S.

Illuminating-glass. J. O. Handy, Assignor to Macbeth-Evans Glass Co., Pittsburgh, Pa. U.S. Pat. 1,287,005, 10.12.18. Appl., 11.4.17.

A white semi-translucent illuminating glass, "free from fire," is formed by fusing a lead soda batch or other mixture capable of producing clear glass with opacifying agents free from fluorine, such as aluminium oxide, a phosphate, and an agent having "the colouring effect or reaction characteristic of sodium chloride."—A. B. S.

Silica bricks, tiles and other articles; Manufacture of —. C. H. Sankey, Chislehurst, and J. E. Foster, Hanley. Eng. Pat. 122,388, 25.11.18. (Appl. 19,370/18.)

Bricks or other articles are made of a mixture of 65 to 80% of silica which has been calcined at 1600° C., crushed, and graded to pass through a sieve having from 16 × 16 mesh to 100 × 100 mesh per square inch, together with 5 to 20% of fibrous material, such as straw, chaff, peat, wool, or hair, and 10 to 30% of calcined silica which has been reduced to a very fine powder by water-grinding. The articles are made in a press or mould, dried, and burned at a temperature above 1500° C., so as to develop a crystalline structure. No flux or binder is needed.—A. B. S.

Brick-drying apparatus. E. J. Moore, Assignor to The Charles Woodward Co., Cleveland, Ohio. U.S. Pat. 1,288,116, 17.12.18. Appl., 6.3.17.

The bricks to be dried are carried on rollers through a series of compartments, arranged one above another, with doors at the end of each compartment which can be turned down into a carrying position.—A. B. S.

Kiln. J. B. Owens, Metuchen, N.J. U.S. Pat. 1,288,955, 24.12.18. Appl., 15.7.16.

A TUNNEL kiln is provided with a furnace intermediate of the ends, a burning zone extending from it towards the inlet of the tunnel, and a drying zone (with heat-radiating means independent of

the walls of the kiln) between the burning zone and the tunnel inlet, equipped with means for circulating air in an upward direction. For the supply of air a tunnel space extends beneath the car-track in the burning zone and another space beneath the car-track in the cooling zone, with intersecting inspection tunnel spaces constituting air inlets. Means are provided for controlling the currents of air flowing from the inspection tunnels to the tunnel spaces.—A. B. S.

Kiln. J. B. Owens, Metuchen, N.J. U.S. Pat. 1,289,530, 31.12.18. Appl., 7.4.16.

A KILN combining in one structure a furnace, smoke exit, and one or more muffle tunnels and open tunnels, is provided with means for conveying the products of combustion transversely from the furnace to the exit in one direction only, producing various temperatures in the several tunnels according to their distance from the furnace. The muffle tunnels and open tunnels are arranged side by side alternately. The furnaces are at one side of the burning zone, and the smoke exits at the other. The preheating and burning zones have communicating flues adjacent to the side wall on which the smoke exits are situated; auxiliary smoke exits are provided adjacent to the opposite side of the preheating zone. The smoke outlets are provided with means for controlling the direction and discharge of the products of combustion.—A. B. S.

Tunnel kilns; Controllable draught for —. J. B. Owens, Metuchen, N.J. U.S. Pat. 1,289,889, 31.12.18. Appl., 5.3.17.

A TUNNEL kiln open throughout its active length, but normally closed at its entry portion where the main draught outlet is situated, has one or more controllable draught outlets for the active entry portion of the kiln, between the main draught outlet and the point where the ware enters the kiln, another controllable draught outlet connected with the interior of the kiln beyond the main draught outlet, and means whereby the direct draught may be caused to pass through the active length of the kiln and out through the draught outlets, and whereby the heat may be forced or "surged" into the normally closed entry portion of the kiln beyond the main draught outlet, so that the ware may be preheated as soon as it has entered the kiln.—A. B. S.

Muffle- [tunnel] kiln. J. B. Owens, Metuchen, N.J. U.S. Pat. 1,289,590, 31.12.18. Appl., 1.4.18.

A TUNNEL kiln has sides constructed of thin panels with intervening thicker panels so as to form muffle walls, and has continuous combustion chambers alongside the latter. The tunnel has an upper section in which a high temperature may be maintained, a lower section containing "semi-inert air," in which a lower temperature is maintained, and means whereby air may pass from the lower to the upper section, the two sections being otherwise kept separate from each other. Means are also provided for withdrawing heated air from the upper section.—A. B. S.

Refractory article. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pats. (a) 1,289,578 and (b) 1,289,966, 31.12.18. Appl., 28.7.18.

A REFRACTORY article containing graphite, a binder, and (a) fine granular, fused crystalline alumina, or (b) zirconia.—A. B. S.

Enamel oven. S. Wiestler, Beach Dam, Wis., Assignor to R. Weimer, Sheboygan, Wis. U.S. Pat. 1,285,682, 26.11.18. Appl., 5.10.17.

LEDGES of reinforced brickwork extend horizontally inwards, one above another, from the outer wall of the oven, and support removable lining sections.—A. B. S.

Seal for electric apparatus. U.S. Pat. 1,288,916. See XI.

IX.—BUILDING MATERIALS.

Blast-furnace slags. Hollmann. See X.

PATENTS.

Moulded articles [electrical insulators] of cement; Manufacture of —. W. E. Windsor-Richards, Southall, Middlesex. Eng. Pat. 121,986, 4.12.17. (Appl. 17,968/17.)

ELECTRIC insulators or other articles are made of a mixture of Portland cement 30 parts, waste asbestos, glass wool, or other suitable fibre 15 parts, and clay 10 parts, with about $\frac{1}{10}$ of its weight of water. For making tubes by extrusion a suitable mixture consists of equal amounts of clay and Portland cement. The wet paste immediately after it has been made is placed in moulds, and subjected to a pressure sufficiently great to remove any excess of water. The moulded articles are dried first on racks open to the air and then in an oven at a temperature of 300°–400° F. (about 150°–200° C.) for 24 hours. The articles may then be impregnated with a waterproofing composition in the customary manner. The clay increases the ability of the paste to flow freely and the crushing strength of the articles and enables them to take a finer polish.—A. B. S.

Moulded articles; Process of making —. J. P. A. McCoy, Wilkinsburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,286,371, 3.12.18. Appl., 3.7.14.

THE articles are made of a mixture of dry sodium silicate and Portland cement which is moistened sufficiently for moulding without dissolving an appreciable quantity of the silicate. The moulded articles are then subjected to the action of steam.—A. B. S.

Water-proof cement, and method of producing it. D. Davidson, Assignor to Bradley and Vrooman Co., Chicago, Ill. U.S. Pat. 1,285,636, 26.11.18. Appl., 12.8.18.

CLAIM is made for a waterproof cement containing an insoluble metallic naphthenate.—A. B. S.

Heat insulating material and process for making the same. H. Castor, McKeesport, Pa. U.S. Pat. 1,288,834, 24.12.18. Appl., 30.7.18.

INFUSORIAL earth cut from natural deposits is subjected to a temperature of 1800° F. (about 980° C.) or above, and is afterwards cut or formed into finished shapes.—A. B. S.

Insulating and building material and process of making the same. A. M. Mitchell, Tuckaboe, N.Y., Assignor to Mitchell and Grenelle, Inc. U.S. Pat. 1,289,862, 31.12.18. Appl., 23.3.16.

DOLOMITE is pulverised and heated to dehydrate it, and whilst still hot a mixture of hot sulphur with a little paraffin is added, and the mixture is poured into moulds and pressed.—A. B. S.

Cement; Acid-resisting —. A. E. Holley and H. W. Webb, Assignors to Chance and Hunt, Ltd., Oldbury. U.S. Pats. 1,287,995 and 1,288,413, 17.12.18. Appl., 4.9.17 and 26.3.18.

SEE Eng. Pats. 110,258 of 1917 and 119,906 of 1918; this J., 1917, 1237; 1918, 768 A.

[Roofing] felt. U.S. Pats. 1,288,158-9. See V.

Potash in cement-mill dust. U.S. Pat. 1,288,437. See VII.

Waste flux from galvanising. Eng. Pat. 121,984. See X.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Phosphorus and silicon in cast iron; Determination of —. A. Cavazzi. *Annali Chim. Appl.*, 1918, 10, 137—149.

VARIOUS modifications of the method of determining phosphorus in cast iron (this J., 1917, 1095) are described. The mixture of ferric sulphate with silica and carbon obtained as in the original method is boiled with about 50 c.c. of water and 10 c.c. of strong nitric acid in a beaker over which is placed a small retort containing cold water to act as a reflux condenser. The retort is changed every 10 to 15 mins. After 30 to 45 mins. the ferric sulphate will have dissolved and the whole of the phosphorus have been converted into orthophosphoric acid. The liquid is then filtered and the residue of silica and carbon washed six times with water acidulated with nitric acid. The filtrate is treated with 15 grms. of ammonium nitrate, and then, while boiling, with 40 c.c. of a boiling solution of ammonium molybdate, stirred for a few mins. and kept at 70° to 80° C. for 30 mins. The precipitate is washed, dissolved, re-precipitated and dissolved in ammonia solution as described (*loc. cit.*). At this point 3 grms. of sodium chloride is added and the solution boiled, with the result that the iron remaining in the phosphomolybdate is completely precipitated as ferric phosphate. After 10 mins. the precipitate is filtered off while hot, washed six times with a boiling solution of 1 gm. of sodium chloride in 50 c.c. of water, ignited, and fused with about 0.3 gm. of a mixture of sodium and potassium carbonates and potassium nitrate. The mass is treated with six successive portions of 3 c.c. of boiling water and filtered, and the filtrate acidified with a few drops of nitric acid, treated with ammonia in slight excess, and added to the main filtrate, and the phosphoric acid is then precipitated with magnesia mixture substantially as previously described. For the determination of silicon the residue of silica and carbon, from which all iron has been removed, is dried apart from the filter paper, and the latter incinerated and added to the dried residue. A quantity corresponding to 1 or 2 grms. of the cast iron is then ignited in a platinum crucible in a blowpipe flame until all the carbon is consumed, and the residue weighed.—C. A. M.

Cast iron and steel; Suggested unification of methods of analysis of —. A. Marinot. *Ann. Chim. Analyt.*, 1919, 1, 5—10.

METHODS are submitted with the hope that, by their use, different chemists will be able to obtain concordant results. To determine total carbon,

three methods are recommended, namely, combustion with sulphuric acid and potassium bichromate, the ordinary combustion method, and a method described by Mahler and Goutal (this J., 1912, 688). For the determination of silicon, the metal is dissolved in a mixture of nitric acid, 400, water, 400, and sulphuric acid, 200 c.c.; the solution is evaporated until sulphuric acid fumes are evolved, cooled, the residue treated with hydrochloric acid, and the silica collected, and weighed. The silica should then be evaporated with hydrofluoric acid to ascertain whether it still contains tungstic or titanous acids. Travers' method (this J., 1917, 906) should be employed for the determination of manganese; phosphorus is determined by the molybdate method, and sulphur by conversion into hydrogen sulphide, which is collected in zinc acetate solution, the zinc sulphide formed being titrated iodometrically. Holland and Bertiaux's method (this J., 1900, 563) is recommended for the determination of arsenic.

—W. P. S.

Steels; Tension, impact, and repeated impact tests of —. T. Matsumura. *Mem. Coll. Eng., Kyoto Imp. Univ.*, 1918, 2, 63—69.

THE impact tests were made in the Charpy machine with the "international" notch, the repeated impact tests on a modified Stanton machine designed by the author. The test-pieces for the latter were 100 mm. long, 15 mm. in diameter with a central notch of 2.5 mm. radius, the diameter of the notched part being 12 mm. At each end is an open slit by means of which it is supported and turned through 180° between successive blows of the hammer. The energy of the blow imparted in cm.-kilos. being three times the diameter in mm., no appreciable difference was observed as the diameter of the test piece was increased from 9 to 13 mm. The number of blows required to produce fracture was taken as the resistance of the steel to repeated impact. The cold work put upon the steel in turning the notched part was removed by wrapping round it a red-hot wire which was allowed to cool before removal. The means of the results recorded are tabulated. The maximum resistance to repeated impact occurred with the 0.25% carbon steel. Resistance in this form of test cannot be correlated with any of the other tests carried out.

Carbon, per cent.	Tensile tests			Impact tests		Repeated impact tests
	Yield point, tons per sq. in.	Max. stress, tons per sq. in.	Elonga- tion, per cent. on 150mm.	Energy absorbed, in.-kilos.	Specific impact energy, in.-kilos.	No. of blows
0.10	15.1	21.0	32	73	42	460
0.19	17.4	27.1	29	43	25	490
0.25	17.5	30.4	25	36	22	570
0.30	19.5	33.6	25	21	12	470
0.55	26.9	49.3	13	12	6.5	480
0.65	28.3	51.7	15	11	6	470

—F. C. Th.

Molybdenum-steel versus gun-erosion. M. Okôchi, M. Majima, and N. Sato. *J. Coll. Eng., Tokyo Imp. Univ.*, 1918, 9, 153—195.

IT has been stated that German gun steel contains 3—4% Mo. Recorded analyses, however, do not show the presence of this element. The physical properties of a series of molybdenum-, tungsten-, and other alloy steels are recorded in Table II., the corresponding analyses being collected in Table I.

TABLE I.

Mark	C %	Si %	Mn %	S %	P %	Mo %	W %	Ni %
M ₁	0.35	0.10	0.29	0.009	0.037	1.05	0	0
M ₂	0.63	0.58	0.22	0.024	0.009	0.69	0	0
M ₃	0.70	0.59	0.23	0.007	to	0.70	0	0
M ₄	0.64	0.59	0.21	0.032	0.013	0.32	0	0
M ₅	0.55	0.25	0.71	0.003	0.036	1.53	0	0
M ₆	0.61	0.32	0.78	0.003	0.034	1.60	0	0
M ₇	0.64	0.36	0.39	0.014	0.027	1.24	0	0
NM ₁	0.54	0.20	1.063	to	0.062	3.65	0	1.02
N ₁	0.59	0.12	0.66	0.003	0.027	0	0	3.50
T ₁	0.62	0.42	0.39	0.004	0.023	0	2.38	0
C ₁	0.32	—	—	—	—	0	0	0

TABLE II.

Mark	Modulus of elasticity, kilos. per sq. mm.	Modulus of rigidity, kilos. per sq. mm.	Poisson's ratio	Coefficient of expansion at 50° C. × 10 ⁶	Thermal conductivity at 50° C.	Electrical resist. at 15° C. × 10 ⁶
M ₁	22,100	8,670	0.275	1.16	0.129	1.002
M ₂	22,050	—	—	1.23	0.093	1.937
M ₃	22,360	—	—	1.17	0.127	1.505
M ₄	21,960	—	—	1.23	0.104	1.924
M ₅	22,746	—	—	1.23	0.102	2.031
M ₆	22,330	—	—	1.29	0.102	2.089
M ₇	21,700	—	—	1.29	0.081	2.159
NM ₁	21,350	8,330	0.281	1.24	0.087	3.144
N ₁	—	—	—	1.16	0.093	2.721
T ₁	21,321	—	—	1.18	0.087	2.802
C ₁	21,800	—	—	1.28	0.127	1.850

The hardness numbers obtained for steel quenched at the same temperature, on heating and on cooling respectively, do not coincide but make a hysteresis loop. In the nickel-molybdenum steel there is a gap of 370° C., i.e., from 330° C. to 700° C., between temperatures to produce equal hardnesses. The rate of expansion of these steels in the γ state ($2.0-2.2 \times 10^{-6}$) is greater than in the α condition ($1.0-1.7 \times 10^{-6}$). A small percentage of molybdenum in steel has no conspicuous influence on the mechanical properties, but produces an increase in the thermal conductivity.

—F. C. Th.

Iron; Rusting of — in contact with other metals and alloys. O. Bauer and O. Vogel. Mitt. K. Materialpruf., 1918, 36, 114–208.

EXPERIMENTS were made to determine to what extent contact with another metal influenced the rate of corrosion of iron in a 1% sodium chloride solution at 18° C. In all cases where two metals were in contact the more noble metal was considerably less corroded than it would have been had it been alone in the solution. This protection is obtained at the expense of the more electro-negative metal. In solutions of lower electrical conductivity this effect is not so marked. Magnesium and zinc alone are of practical value as protective metals for iron, the advantage resting with the zinc on account of the easier disintegration of the magnesium. In contact with copper iron is much more strongly attacked than it would be were it alone. As the concentration of the salt solution is increased the rate of attack of the iron in contact with copper is diminished. Zinc and magnesium when alone are more strongly attacked as the salt content of the electrolyte is raised, while iron alone is rather less attacked. With regard to the protective effect of zinc and magnesium in different salt solutions it was shown that the conductivity of the electrolyte is of considerable influence, the higher this is the more efficient is the protection of a given amount of the protecting metal. When no visible rusting of the iron could be detected complete immunity from corrosion occurred. It was noticed that the direction in which an electric current was passed through the electrolyte was of importance, since a higher resistance was shown when the current passed from a large electrode to a smaller one than when the direction was reversed. A "limit of protection" was determined which is given as the current in amperes per sq. cm. which will

just inhibit corrosion. For the 1% salt solution this limit was 0.0000106. It is thus possible to determine the current required completely to protect a given surface of iron in sea water. (See also J. Chem. Soc., Mar., 1919.)—F. C. Th.

Iron; Periodic passivity of —. A. Smits and C. A. Lobry de Bruyn. Proc. Acad. Wetensch. Amsterdam, 1919, 21, 382–385.

ANODICALLY polarised iron can be activated by the introduction of halogen ions. Hence by the electrolysis of a solution of ferrous sulphate and chloride the phenomenon of passivity can be made periodic (compare this J., 1916, 471). This periodicity has been photographically recorded together with the time duration of each stage of the process. The potential difference varied from -0.3 volt to +1.4 volt with respect to the normal calomel electrode and the current density changed from 33 milliamperes to 28 milliamperes per sq. cm. With a sealed-in electrode 1.5 cm. long the iron was active for a short period and passive for a comparatively long period. With a smaller current density the active and passive periods became nearly equal. When a larger iron electrode was used, the potential difference showed irregular oscillations whilst the current strength was regularly periodic. The irregularity was such that even the most active state did not recur regularly and the whole curve showed periodicity under the influence of great disturbances. Hence it follows that the electrode was never active throughout the whole area at the same time. This confirms the previous view that the difficulty of rendering an iron electrode passive increases with increasing size of the electrode.—J. F. S.

Iron-oxygen; The system —. A. Smits and J. M. Bijvoet. Proc. Akad. Wetensch. Amsterdam, 1919, 21, 336–400.

THE three-phase systems FeO-Fe-gas, and Fe₃O₄-FeO-gas are considered theoretically for the cases where the gas phase is either CO and CO₂ or H₂ and H₂O. On the basis of the deductions drawn from the above considerations, the processes operative in the blast-furnace are theoretically investigated. The P.T.-diagram of the system oxygen-iron is derived from the equilibria of the iron oxides in reducing and oxidising gases respectively. Calculations are made of the oxygen dissociation tension: these values, as was to be expected, are very small.—J. F. S.

Blast-furnace slags; Microstructure and disintegration of — rich in lime. E. Hollmann. *Stahl u. Eisen*, 1919, **39**, 57—62, 91—95.

THE microstructure of a slag obtained in smelting for pig iron for use in the basic process is described, and illustrated by means of 18 photomicrographs. Its composition is given as SiO_2 31.82, Al_2O_3 17.11, CaO 42.01, MgO 2.85, FeO 0.84, MnO 2.63, CaS 2.11, and P_2O_5 0.17%. The principal crystallographic constituent was melilite, which is regarded as an isomorphous mixture the two end-members of which are gehlenite ($3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$) and akermanite ($4\text{CaO} \cdot 3\text{SiO}_2$). Besides melilite the micro-sections show practically nothing but glass, the quantitative ratio between melilite and glass varying from about 1:10 to 1:2. When the melilite crystals are fully developed but little glass is present, and usually another silicate, regarded as lime-olivine, appears. The latter separates after melilite. Another slag of very similar composition showed a considerable quantity of lime-olivine in the melilite crystals. These inclusions were observed only in the case of slags showing a tendency to crumble, and unequal expansion of the two constituents is advanced as a possible explanation of disintegration. Slags containing more than 43% CaO must be regarded as likely to undergo disintegration.—W. R. S.

Lead in brass and alloys; Rapid estimation of —. G. H. Hodgson. *Chem. News*, 1919, **118**, 37—38.

RAPID gravimetric and volumetric methods for the estimation of lead in brass and similar alloys are described. *Gravimetric method.* Five grams of the alloy is dissolved in 25 c.c. of nitric acid (sp. gr. 1.4), the solution is diluted with 200 c.c. of water, and sufficient ammonia solution (20 c.c. of sp. gr. 0.880) added to precipitate all the copper. Sufficient 80% acetic acid is then added to produce a clear, slightly acid solution, which is treated with 10 c.c. of 3% potassium bichromate, shaken, and allowed to stand for an hour. The precipitated lead chromate is collected on a paper pulp pad, washed to remove the copper, and treated on the filter with hot 30% sulphuric acid until entirely converted into sulphate. The sulphate is washed with water and dissolved by pouring about 40 c.c. of hot ammonium acetate solution containing acetic acid through the filter. The solution is raised to the boiling point, and treated with ammonium molybdate. The precipitate is collected on an ashless paper pad, washed with water containing a little ammonium acetate, ignited, and weighed as lead molybdate. The whole process may be completed in four hours. *Volumetric process.* The lead is precipitated as chromate as described above, the chromate precipitate is washed with water and warm dilute acetic acid (5%) until free from copper and excess potassium chromate, then dissolved by pouring cold hydrochloric acid (1:4) on the filter, and the pad is finally washed with water to collect all the chromic acid. The free chromic acid may then be estimated by titration with standard ferrous ammonium sulphate or by adding potassium iodide solution and titration of the liberated iodine by standard sodium thiosulphate solution.—J. F. S.

Solids [metals, etc.]; Determination of the compressibility of — at high pressures. L. H. Adams, E. D. Williamson, and J. Johnston. *J. Amer. Chem. Soc.*, 1919, **41**, 12—42.

THE compressibility of a number of metals and minerals has been determined for pressures up to 12,000 megabars (1 megabar = 0.987 atm.). The principle of the method employed is to compare the change of volume under pressure of a cylinder of the material with that of a similar cylinder of

soft steel, the compressibility of which was considered to be 0.60×10^{-6} sq. cm. per megadyne. The solid, surrounded by kerosene, is enclosed in a thick-walled steel bomb fitted with a movable non-leaking piston, and pairs of simultaneous readings are made of the displacement of the piston, that is the volume change and the pressure. The pressure-compressibility graphs for gold, copper, brass, silver, aluminium, and calcite, like that of steel, are linear, but the graphs for zinc, tin, cadmium, lead, a tin-bismuth alloy, quartz, bismuth, and sodium chloride show an appreciable curvature, indicating for those substances a measurable decrease of compressibility with increasing pressure. A comparison was made of the compressibility of two alloys with that of their components. In the case of a simple mixture such as the tin-bismuth alloy, the measurements indicate that the compressibility of mixtures, whose other properties, such as specific volume, electrical conductivity, and specific heat are approximately linear functions of the composition, is related in the same way to the compressibility of the components. On the other hand, the compressibility of alloys of the type of brass is much lower than the sum of the individual compressibilities.—J. F. S.

Electric welding. T. T. Heaton. *Inst. Mech. Eng.*, Nov., 1918. [Advance proof.] 23 pages.

OF the hand-operated processes, the Bernardos method, using a carbon electrode, is the only one which fuses together the two metal surfaces, and gives a true weld. Other processes, e.g., the Kjellberg and Quasi-Arc processes, employ a metallic electrode, which is usually of different composition to that of the work metal, and therefore are more in the nature of soldering. The speed of welding by the Bernardos method is considerable, a rate of 1.75 mins. per foot for mild steel 3.5 mm. thick being quoted for an unhammered weld. This method is considered superior to others for metal sheets of less than $\frac{1}{8}$ in. thickness. In the Kjellberg and Quasi-Arc processes the metallic electrode is positive to the work and in fusing is deposited upon it together with a protective vitreous slag from a silicious coating on the electrode. Mechanically operated machines are to be preferred for work of a straightforward nature where the relative positions of the electrode and work can be maintained. Resistance welding may be performed either slowly with a small electrical input or at a quick rate, a heavy current being used for a short time and the metal "burned" at the joint. The weld is then pressed up and the "burned" metal squeezed out. In all cases the metal to be welded must be of suitable quality, and mild open-hearth steel with carbon content below 0.1% and sulphur not above 0.05%, together with low phosphorus, was found most satisfactory. The testing of welds depends on the service required, and when not subject to pressure a simple penetrative test with petroleum is suggested. High-pressure tests must be used with caution and in many cases, e.g., the hulls of ships, cannot be applied. Tensile and elongation tests are often misleading and further research is needed to establish useful working test methods.—C. A. K.

Oxy-acetylene welding. J. H. Davies. *Inst. of Mech. Eng.*, Jan., 1919. [Advance proof.] 10 pages.

THE oxy-acetylene process possesses many advantages over other methods as the operating flame can be readily controlled and the heating localised. Pure acetylene and an accurate adjustment of the mixed gases to give a neutral atmosphere are essential. Both the chemical and physical proper-

ties of the metal are altered by the rapid heating and melting. Carbon, silicon, and manganese are diminished, but the use of a welding rod of suitable composition may correct this defect. The alteration in mechanical properties (tenacity and elasticity) cannot be remedied by simple hammering of the hot weld, but should be aided by proper thermal treatment. Slow cooling gives the most efficient weld. The oxy-acetylene flame is preferred for lighter sheets, but when the metal has a thickness of $\frac{3}{8}$ in. or more electric welding has the advantage both in speed and cost.—C. A. K.

PATENTS.

Potash salts; Recovery of — in the manufacture of pig iron. T. Twynam, Redcar, Yorks. Eng. Pat. 122,048, 21.1.18. (Appl. 1149/18.)

MOLTEN blast-furnace slag is treated with sodium chloride, or a mixture of the latter with lime or sodium carbonate, and the resulting fume of potassium chloride is condensed. Potash-bearing minerals, such as feldspar, may be previously added to the slag or introduced with the sodium chloride.

—W. E. F. P.

Iron; Puddling of —. J. E. Fletcher, Dudley. Eng. Pat. 122,244, 16.1.18. (Appl. 920/18.)

For the production of metal suitable for puddling and the manufacture of good wrought iron, non-haematite pig iron and scrap steel or iron, in about equal proportions, are melted in a cupola with or without the addition of lime and silica, and the melted metal is run off at a temperature of about 1500° C. A small proportion of powdered, rich iron ore may be added to the molten metal or to the cupola charge.—C. A. K.

Steel rails; Treatment of —. Steel rail. R. A. Lewis, W. R. Shimer, and W. J. Thomas, Bethlehem, Assignors to Bethlehem Steel Co., South Bethlehem, Pa. U.S. Pats. (A) 1,285,743 and (B) 1,285,749, 26.11.18. Appl., 15.5.15.

(A) THE hot rail from the finishing rolls is quickly cooled to a temperature between 1300° F. and 1000° F. (700° C.—550° C.), and reheated uniformly to between 1400° F. and 1500° F. (770° C.—830° C.). It is again rapidly cooled to between 1000° F. and 600° F. (550° C.—330° C.), reheated in an annealing furnace to 1000° F.—1200° F. (550° C.—660° C.), and finally cooled. (B) Claim is made for a steel rail of finely granular pearlitic structure, almost free from ferrite, containing 0.60–0.90% C, 0.50–1.0% Mn, with other impurities as in open-hearth steel. The mechanical properties are: tensile strength over 115,000 lb. per sq. in.; elastic limit over 70,000 lb. per sq. in.; elongation over 15%; reduction in area over 30%, and a hardness number (Brinell) over 225.—C. A. K.

Steel alloy. J. W. Weitzenkorn, Assignor to Electric Reduction Co., Washington, Pa. U.S. Pat. 1,287,153, 10.12.18. Appl., 25.1.18.

AN alloy steel containing not more than 0.60% (0.35%) C, 0.5–1.5 (1.0%) Cr, 0.1–0.5 (0.15%) V, and 0.5–1.25 (0.75 to 1.0%) Mo.—C. A. K.

Chrome-steel. Spring steel. C. H. Wills, Detroit, Mich. U.S. Pats. (A) 1,288,344 and (B) 1,288,345, 17.12.18. Appl., 7.8.17.

(A) THE claim is for a case-hardening steel containing up to 1% Mo. The refining of the core and case may be accomplished simultaneously. (B) A heavy-duty spring steel containing 0.38–0.55% C, 0.40–1.25% Mn, up to 2% Cr, 0.10–0.40% Si, and up to 1% Mo, is drawn at a temperature materially above 320° C.—C. A. K.

Open-hearth steel; Manufacture of —. H. C. Ryding and A. W. Allen, Birmingham, Ala. U.S. Pat. 1,289,037, 24.12.18. Appl., 6.7.17.

BASIC open-hearth steel is made in two alternating operations: (1) The furnace is charged with lime and iron oxide, then with molten low-carbon metal, and heated until the bath and slag are in proper condition. High-carbon metal is then added and the operation carried to a finish. (2) The furnace is first charged with molten low-carbon metal, then with iron oxide and lime, and the same procedure follows. The first set of conditions builds up the bottom of the furnace, the second tends to erode it, and the alternating conditions maintain an approximately uniform bottom.—C. A. K.

[Steel;] *Process of annealing metal* [—]. J. H. Bennett, Worcester, Mass. U.S. Pat. 1,289,092, 31.12.18. Appl., 14.8.18.

LOW-CARBON steel is heated, and afterwards cooled and "softened" by means of water to which a saponaceous material has been added.—T. H. B.

Iron or iron alloys; Manufacture of articles from pure powdered —. Allgem. Elektrizitäts Ges., Berlin. Ger. Pat. 306,772, 24.5.16.

POWDERS of pure iron or of iron alloys prepared by electrolytic processes, alone or in admixture with powders of other metals, are formed under heavy pressure into articles which are hardened in a reducing atmosphere and may be fashioned into the desired shape by subsequent mechanical working. The electrolytic metal powder may be subjected to a heating process before compressing.

—J. F. B.

Iron and steel; Solution for rust-proofing —. W. H. Allen, Assignor to Parker Rust-Proof Co. of America, Detroit, Mich. U.S. Pat. 1,287,605, 17.12.18. Appl., 16.6.16.

A RUST-PROOFING bath consists of a solution of phosphoric acid and an alkali chromate.—T. H. B.

Rust-proofing and nut-locking; Solution for —. C. D. Matthews, Assignor to H. R. Pedane and B. F. Feitel, New Orleans, La. U.S. Pat. 1,289,855, 31.12.18. Appl., 19.2.18.

A SOLUTION for treating iron and like metals consists of a saturated acetic acid solution of common salt mixed with an equal amount of nitric acid.

—T. H. B.

Electric [smelting] furnaces. A. E. White, London. From Industrial Electric Furnace Co., Chicago, Ill., U.S.A. Eng. Pat. 122,282, 1.2.18. (Appl. 1896/18.)

THE ore charge is fed over an inclined surface, in an upward direction, to the melting chamber by means of a feeding mechanism, and is brought into contact with the lower edge of the furnace roof forming a seal therewith. Contact of the charge with the central electrode projecting downwards through the roof of the furnace is prevented. The escaping gases pass through the charge, and the condensed metal flows down the inclined surface, away from the source of heat, into troughs from which it is drawn off.—B. N.

Furnace; Metallurgical —. B. Zobel, Philadelphia, Pa. U.S. Pat. 1,285,883, 26.11.18. Appl., 17.12.17.

IN A crucible furnace heated by means of a fire chamber below, the crucible rests on a supporting column which can be moved in a vertical or rotary direction.—C. A. K.

Melting furnace. T. W. Muckle, Denver, Colo., Assignor to The Case Manufacturing Corp. U.S. Pat. 1,286,719, 3.12.18. Appl., 18.3.18.

A MELTING furnace disposed in a substantially horizontal position has a melting chamber with a flat bottom and is provided with a fuel inlet towards the top rear end and an outlet towards the opposite forward end. Means are provided for introducing fuel in the form of a strong blast flame projected across the top of the melting chamber and down its opposite side wall, so that combustion of the fuel is completed before the flame strikes the melting mass on the flat bottom of the furnace.—J. H. P.

Furnace; Metal-heating —. W. S. Rockwell. Assignor to W. S. Rockwell Co., New York. U.S. Pats. (A) 1,288,202, 17.12.18, and (B) 1,289,547, 31.12.18. Appl., 28.8. and 20.8.18.

(A) Gaseous fuel is burned in a combustion chamber under the heating chamber and the products of combustion are admitted through a number of holes through the bed. The gases leave through ports extending along the side walls and are discharged through collecting flues on each side of the furnace, controlled by dampers, into a casing in which the air for combustion is preheated. (B) A metal-heating furnace is provided with burner openings arranged alternately in each of its opposite side walls, and flaming gases are introduced through the burners into the heating chamber above the floor. Flaming gas-ducts below the floor of the heating chamber are each connected at one end with a burner and at the other end with the heating chamber through the floor. Outlet flues are arranged in the side walls alternately with the burner openings.—C. A. K.

Annealing furnace. W. A. Wood, Dunellen, N.J., and W. S. Rockwell, Assignors to W. S. Rockwell Co., New York. U.S. Pat. 1,288,353, 17.12.18. Appl., 16.4.17.

THE furnace has a chamber heated by non-oxidising products of combustion, and is provided at opposite ends with hoods which extend downwards below the floor of the chamber nearly to the surface of a body of water. The water level can be varied to vary the discharge of gases from the hoods. The articles to be annealed are carried through the heating chamber and hoods by a conveyor.

—T. H. B.

Waste flux of galvanising or equivalent processes; Obtaining of by-products from —. S. Saunders, Birmingham. Eng. Pat. 121,984, 27.11.17. (Appl. 17,494/17.)

Waste flux from a galvanising process is broken up, lixiviated with boiling water, and the zinc oxide froth is removed and dried. Suspended matter is allowed to settle, the process being aided by the addition of a little lime. The clear liquor, consisting of a mixture of zinc and ammonium chlorides, is run over a bed of "bleaching lime" to remove impurities, and may then be utilised in the fireproofing of wood or textile materials. Any metal is recovered from the sediment by washing, and after drying, the residue is mixed with a binding agent, e.g., waste lime obtained in the process, and pressed into fireproof sheets.—C. A. K.

Tinned scrap; [Electrolytic] treatment of —. H. Rogers, M. L. Lancaster, C. M. Walter, and J. Jackson, Birmingham. Eng. Pat. 122,025, 10.1.18. (Appl. 577/18.)

A ROTARY gauze drum containing the tinned scrap may be lowered into, or completely removed for emptying from, a vat which contains the electro-

lyte. Trunnions on the drum rest on supports carried by the vat and serve to convey current to the scrap metal. Cathode plates suspended in the vat are preferably of corrugated form, and a tray is arranged beneath the drum for the collection of tin oxide or sediment. The drum may be oscillated or rotated, and the electrolyte may be circulated through the drum by pumping.—C. A. K.

Electroplating device. J. E. Woodbury, Worcester, Mass. U.S. Pat. 1,285,875, 25.11.18. Appl., 29.3.18.

THE apparatus comprises a cathode supported above the surface of the electrolyte in a suitable container, an anode extending towards the cathode, and a nozzle, having an outlet opening at the upper edge of the anode; by means of a pump a concentrated stream of electrolyte is delivered through the nozzle over the anode against a restricted area on the bottom of the cathode, and a current is passed from the anode to the cathode through the stream.

—B. N.

[Zinc] furnace; Electric —. B. Ræder, Kykkelsrud, Norway. U.S. Pat. 1,286,100, 25.11.18. Appl., 22.1.18.

THE walls of the charging shaft project into the reaction chamber of the furnace, and terminate at a point above the level of the bath, the reaction chamber being provided with electrodes and the charging shaft with a supplementary electrode.

—B. N.

Separation of minerals by flotation; Apparatus for the —. F. D. S. Robertson, Toronto, Canada. U.S. Pat. 1,286,111, 25.11.18. Appl., 5.12.17.

A DISHED table is journaled on the crank of a cranked hollow vertical shaft and is caused to rotate on the crank at the same time as the shaft is rotating. The mineral pulp is delivered on to the table through holes in the upper part of the shaft over a distributing plate and the heavier constituents are discharged near the centre of the table into a catch pan below, which communicates with the lower part of the hollow shaft. The table is enclosed in a tray which receives material discharged from the rim of the table.—C. A. K.

Separating minerals by flotation. A. G. Betts, Stockhouse, N.C. U.S. Pat. 1,286,922, 10.12.18. Appl., 14.8.14. Renewed 1.6.18.

FINELY divided sulphide ores are agitated with water and a flotation reagent. An oxidising reagent, e.g., chlorine, is added to the bath, whereby the surface of the sulphide particles become coated with a thin film of sulphur which aids the buoyancy of the particles and facilitates their separation by flotation.—C. A. K.

Ores; Concentration of —. O. Wiser, Assignor to Chino Copper Co., Hurley, N. Mex. U.S. Pat. 1,288,350, 17.12.18. Appl., 27.2.17.

THE ore in a finely divided condition is agitated in a mixture of oil, water, and a suitable resinate, and the metallic particles separated by froth flotation.

—T. H. B.

Alloy; Bearing —. W. D. Berry, New Brighton, Pa. U.S. Pat. 1,286,921, 10.12.18. Appl., 13.8.18.

A COPPER base bearing alloy containing 60–80% Cu. 1–35% Pb, and 3–20% Sb.—C. A. K.

Alloys rich in phosphorus; Process of manufacturing metallic phosphides or —. P. E. Demmler, Pittsburgh, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,287,653, 17.12.18. Appl., 4.2.18.

PHOSPHORUS in the form of vapour is passed over heated copper (or zinc, etc.) at such a temperature that the phosphorus combines with the metal, but neither the metal nor the resulting alloy melts. —T. H. B.

Tungsten-reducing furnace. C. A. Pfauistiehl, Waukegan, Ill., Assignor to Pfauistiehl Co., Inc., North Chicago, Ill. U.S. Pat. 1,280,896, 31.12.18. Appl., 20.4.15.

A FURNACE for reducing tungsten trioxide comprises a comparatively long and slender metal tube, with means for passing a reducing fluid through it from end to end. A portion of the tube at one end constitutes a charging chamber heated by the escaping hot reducing fluid. Next to this is a second chamber surrounded by an electric heating device, then a third chamber heated by an independent electric heater, and finally a cooling chamber at the fluid admission end of the tube. Means are provided for passing the tungsten trioxide through the successive chambers.—A. B. S.

Castings of rare-earth metals and their alloys; Process of making —. A. and M. Hirsch, New York, Assignors to Alpha Products Co., Inc. U.S. Pats. (a) 1,290,010 and (b) 1,290,011, 31.12.18. Appl., 9.5.18 and 17.9.17. (b) Renewed 29.11.18.

(a) In casting cerium and lanthanum, or alloys of these metals with 10% or less of iron, the temperature of the metal when poured is kept sufficiently low to prevent inflammation of the metal. The ratio of the area (in sq. in.) of the metal moulding surface from which withdrawal of heat may take place to the volume (in cub. in.) of the casting to be made is greater than 16:1, and the residual heat-absorbing capacity of the mould is reduced so as not to affect the homogeneity of the cast metal. (b) Cerium and similar metals are melted under a layer of molten barium chloride to prevent oxidation and ignition.—C. A. K.

Copper; Treatment of cement —. C. A. Hall, Assignor to Pennsylvania Salt Manufacturing Co., Philadelphia, Pa. U.S. Pat. 1,290,024, 31.12.18. Appl., 8.1.17. Renewed 10.9.18.

CEMENT copper is compressed into brick form in the presence of "waste liquor," which acts as a binder, the bricks being afterwards dried, and melted to recover the copper.—T. H. B.

Copper; Extraction of — from its ores. H. W. Morse, Los Angeles, Cal., Assignor to Chino Copper Co., Hurley, N. Mex. U.S. Pat. 1,288,121, 17.12.18. Appl., 27.2.17.

ORES containing cuprite with other oxides and copper sulphide are treated with dilute sulphuric acid in amount corresponding to one-half of the copper in the cuprite, whereby part of the copper in the cuprite is dissolved as sulphate and part is precipitated as metallic copper. The resulting pulp is subjected to flotation to separate metallic copper and sulphide. Dissolved copper is precipitated as metal by a reducing agent, and the precipitated copper is separated together with the remaining copper sulphide by flotation.—T. H. B.

Nickel; Extraction of — from silicate ores. H. W. C. Annable, Egham, Assignor to Nickel Concentration, Ltd., London. U.S. Pat. 1,289,072, 31.12.18. Appl., 15.5.17.

A SILICATE nickel ore is heated in presence of moist hydrogen sulphide to convert the nickel silicate into sulphide.—T. H. B.

Cinder, ores, and metallurgical products containing copper and zinc; Process for roasting and chlorinating —. W. Buddeus, Berlin. Ger. Pat. 306,790, 29.6.17.

CINDER, ores, or metallurgical products containing copper or zinc are mixed with not more than 10% of salt and, after undergoing a preliminary heating, the mass is introduced in the form of a "closed, travelling column of ore" into a shaft furnace in which it is roasted by means of compressed air.—J. F. B.

Etching steel or other plates; Method of —. W. S. Eaton, Sag Harbor, N.Y., U.S.A. Eng. Pat. 122,358, 26.6.18. (Appl. 10,519/18.)

SEE U.S. Pat. 1,275,408 of 1918; this J., 1918, 659 A.

Zinc; Refining of —. G. C. Fricker, Luton. U.S. Pat. 1,287,949, 17.12.18. Appl., 27.1.17.

SEE Eng. Pat. 110,970 of 1916; this J., 1917, 1278.

Drying apparatus. Eng. Pat. 122,077. See I.

Annealing furnace. U.S. Pat. 1,286,908. See I.

Treating pickle liquors. U.S. Pat. 1,287,939. See VII.

Electrolytic apparatus. U.S. Pat. 1,287,156. See XI.

Electrical etching. U.S. Pats. 1,288,775 and 1,289,022. See XI.

Electric furnace. U.S. Pats. 1,289,055-6. See XI.

Determining transformation points. U.S. Pat. 1,285,929. See XXIII.

XI.—ELECTRO-CHEMISTRY.

Erinoid; Insulating properties of —. R. G. Allen. Sci. Proc. Roy. Dublin Soc., 1918, 13, 331—358.

THE electrical insulation resistance of different varieties of "erinoid" (a by-product of milk) and of red vulcanised fibre was measured at various temperatures up to 110° C. The results agreed with Rasch and Hinrichsen's formula (see Allen, page 140 A). Dry erinoid is a good insulator of fairly constant insulation resistance. It is slightly hygroscopic, but not so much so as vulcanised fibre. Erinoid does not absorb water when in direct contact with it so readily and to such an extent as vulcanised fibre, nor is it so retentive of the water absorbed as the latter. Of the varieties tested, red erinoid is the most absorbent of water, and generally of the lowest insulation resistance. Dry erinoid has a fairly constant electrical resistance, but in a moist atmosphere the resistance decreases with time owing to the absorption of water. The resistance of the unprepared surface of erinoid depends greatly on the value of the applied voltage unless water electrodes are used, but if the surface has been machined the resistance is

dependent on the voltage like that of vulcanised fibre. Erinoid is almost free from dielectric absorption; that of red vulcanised fibre is appreciable. The specific resistance of erinoid diminishes with the thickness of the sample. Erinoid of blonde colour has a considerably higher resistance than the other varieties tested; this is due to greater skin or contact resistance, as the difference disappears when machined specimens of the different varieties are compared. The break-down voltage of erinoid is the same as that of red vulcanised fibre; for a well-dried sample 2 mm. thick the r.m.s. value is within the range 10,000–16,000; it is diminished by soaking the material in water, mineral oil, or castor oil.—A. B. S.

Vulcanised fibre and erinoid; Absorption of water by — on exposure to moist air and the subsequent change in electrical resistance. R. G. Allen. Sci. Proc. Roy. Dublin Soc., 1918, 15, 405–414.

SAMPLES of red vulcanised fibre and erinoid were well dried in an air oven at 70° C., weighed, and re-weighed at intervals after exposure to air nearly saturated with moisture. It was found that red vulcanised fibre is much more hygroscopic than erinoid, and red erinoid somewhat more so than blue erinoid. After being thoroughly dried and then exposed to moist air, the electrical resistance of both fibre and erinoid, particularly that of the former, diminishes rapidly. The variation of resistance of the moist samples with the temperature is in accord with Rasch and Hinrichsen's formula, and supports the theory that electricity is conducted through insulating materials by means of water films therein.—A. B. S.

Electrical resistance of porcelain. Allen. See VIII.

PATENTS.

Ozonising apparatus. R. R. Bayeux and J. Richard. Paris. Eng. Pat. 113,606, 16.1.18. (Appl. 933/18.) Int. Conv., 5.2.17.

TWO independent concentric solenoids are carried by glass tubes, and are connected each to one pole of the secondary of an induction coil for the production of ozone. The apparatus is provided with a stop-cock, connected to an oxygen supply, whereby the gas may be distributed in fixed and variable proportions to the ozoniser and to a by-pass tube parallel to the ozoniser. The gases from the ozoniser and the by-pass tube are passed into a mixing chamber which is designed to receive a hypodermic needle or the like, or a suitable pipe or tube, whereby fixed proportions of ozone and oxygen, which may be varied by the regulating stopcock, may be used for hypodermic injections or the like.—B. N.

Electric conductors [; Covering for —]. Fullers Wire and Cable Co., Ltd., and G. Fuller, Chadwell Heath, Essex. Eng. Pat. 122,295, 14.2.18. (Appl. 2976/18.)

A MIXTURE of rubber and vegetable fibrous material is worked into a plastic condition, and "forced" in the known manner as a covering for cable or wire, which is then vulcanised. The proportion of fibrous material may be as high as 60%. The covering prepared in this way is exceedingly tough and resistant to wear by abrasion.—D. F. T.

Insulating material; Composite — and process of making the same. L. McCulloch, Wilkinsburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,286,043, 26.11.18. Appl., 3.2.16.

A COMPOSITE insulating material is composed of heat-resistant flake material, such as mica, the

flakes being superposed and cemented together by coating with a binder of "bentonite" and water, the assembled material being pressed and dried.—B. N.

Electrolytic cell. Ia F. D. Vorce, Sandwich, Ont., Canada. U.S. Pat. 1,286,844, 3.12.18. Appl., 2.4.18.

THE cathode, carrying a diaphragm, is spaced from the outer casing of the cell, the diaphragm forming a partition between the cathode chamber and an electrolyte chamber. The space between the cathode and the casing is closed by a sealing ring, carried by the top of the cathode, and anodes, within the electrolyte chamber, are carried by a cover supported by the casing.—B. N.

Electrolytic apparatus [for production of tin silicofluoride]. R. L. Whitehead, Perth Amboy, N.J. U.S. Pat. 1,287,156, 10.12.18. Appl., 22.6.15.

A CELL or vat containing a hydrofluosilicic acid electrolyte is provided with a number of tin anodes. Removable cathodes, enclosed in porous compartments to prevent the deposition of metallic tin thereon, alternate with the anodes.—C. A. K.

Electric battery. N. K. Chaney, Lakewood, Ohio. Assignor to National Carbon Co., Inc. U.S. Pat. 1,287,634, 17.12.18. Appl., 7.6.16.

THE carbon used in a dry cell is wetted with an acid, an oxidising agent is added to oxidise the ferrous sulphide therein, and zinc oxide is added to neutralise any excess of acid.—B. N.

Electric battery. R. C. Benner, and H. F. French, Fremont, Ohio, Assignors to National Carbon Co., Inc. U.S. Pats. (a) 1,289,365 and (b) 1,289,366, 31.12.18. Appl., (a) 13.7, (b) 31.7.16.

(a) THE negative element is composed of copper oxide bound together by sulphur, in an alkaline electrolyte. (b) Selenium is used in place of sulphur in the negative element.—B. N.

Electric battery. W. C. Bauer, Evanston, Ill. U.S. Pat. 1,289,609, 31.12.18. Appl., 3.4.14.

A ZINC anode and a lead oxide cathode are immersed in an alkali hydroxide electrolyte, together with a substance to precipitate the soluble lead compounds which may be formed.—B. N.

Depolarising agent; Black-streak manganese dioxide —. C. Ellis, Montclair, N.J., Assignor to National Carbon Co., Inc. U.S. Pat. 1,289,707, 31.12.18. Appl., 2.10.17.

DEPOLARISING material, containing manganese dioxide which gives a dead black streak, is formed by exposing manganous sulphate in aqueous solution at a temperature near the boiling point of water to the action of free chlorine, the solution containing less than 10% of free acid. The higher oxide of manganese formed is washed till substantially free from bodies tending to cause local action in Leclanché cells.—B. N.

Temperature control apparatus [for electric furnaces]. E. F. Collins, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,287,236, 10.12.18. Appl., 6.5.18.

IN electric furnaces having co-operating arcing electrodes, moved by a motor, the motor is controlled by a device provided in the electrical supply circuit for the electrodes, which is responsive to the electrical condition in the circuit. The furnace is provided with a pyrometer connected to an electro-responsive device, with a means responsive to this

device for adjusting the setting of the motor control means. The length of the arc is thus regulated in accordance with an electrical condition of the operating current, and the relation between the arc length and this condition is adjusted in accordance with the temperature of the furnace.—B. N.

Furnace; Electric ——. W. K. Booth, Assignor to Booth-Hall Co., Chicago, Ill. U.S. Pat. 1,287,849, 17.12.18. Appl., 4.4.18.

A FURNACE-WALL contact is formed by placing in a bed in the furnace wall a mixture of materials adapted to react and produce a metallic carbide, a skeleton grid being embedded in the mixture and equipped with a shank extending through the furnace wall. The mixture, whilst in position, is subjected to the action of an electric arc, thus raising it to the temperature necessary to form a monolithic mass of carbide.—B. N.

Furnace; Electric ——. L. L. Simpson, Assignor to A. H. Sroufe, Seattle, Wash. U.S. Pat. 1,288,240, 17.12.18. Appl., 24.7.15.

THE cover of the electric furnace comprises a pair of parallel side leaves spaced at their inner edges when laid so as to close the furnace, and a second pair of leaves of a width approximately the distance between the closed side leaves. All the leaves, when the furnace is closed, co-operate to form an opening for a carbon.—B. N.

Electric furnace. L. G. Rowand, Brooklyn, N.Y., Assignor to New Jersey Zinc Co., New York. U.S. Pats. (A) 1,289,055 and (B) 1,289,056, 24.12.18. Appl., 5.6.17.

(A) A VERTICAL chamber is heated by a number of annular electric resistors lining the furnace. The charge is admitted at the top and withdrawn at the lower end, and vapours from various sections of the furnace are withdrawn at different heights and condensed in separate condensers. Resistors extending across the furnace, out of vertical alignment, may also be provided to agitate the descending charge. (B) A series of narrow vertical heating chambers for ore reduction are arranged in line for convenience in charging and discharging. The several vapour outlets of a chamber communicate by means of a flue with a single condenser, and the resistors are so arranged as to heat the upper part of the flue.—C. A. K.

Gases; Process and apparatus for the electric arc treatment of ——. *Stretching out double or multiple electric arcs*. F. H. A. Wielgolaski, Christiania, Norway. U.S. Pats. (A) 1,287,807 and (B) 1,287,808, 17.12.18. Appl., 28.9.16.

(A) An elongated arc is maintained lengthwise and substantially centrally in a long arc chamber between two electrodes, one of which is hollow and constitutes a restricted outlet for the gases. The latter are introduced through a tangential slit-like opening throughout substantially the length of the chamber, and are withdrawn through the restricted opening, which is located opposite to a conical projection on the shell of a steam boiler. A current of cooling water is projected against the inner concave surface of the cone, thus effecting rapid cooling of the gases. A pressure is maintained in the arc chamber materially higher than in the cooling chamber. (B) Elongated bent arcs are maintained by blowing into the chamber surrounding the arc a current of cold air around "the legs of the bight of the arc" so that the resistance in a U-shaped arc is lower near the centre of the furnace space. "Insulating walls" of cold gases moving transversely prevent the arc short-circuiting upon itself.—B. N.

Electrical etching. J. H. Weeks, Rutledge, Pa., Assignor to J. S. Weeks, Delaware County, Pa., and R. M. Weeks, Philadelphia, Pa. U.S. Pat. 1,288,775, 24.12.18. Appl., 3.3.17.

A RESISTANT image to be etched is carried by the anode in an electrolyte consisting of a solution of ammonium chloride with the addition of an acid.—B. N.

Electrical etching; Process and composition for ——. J. H. Weeks, Rutledge, Pa., Assignor to J. S. Weeks, Delaware County, Pa., and R. M. Weeks, Philadelphia, Pa. U.S. Pat. 1,289,022, 24.12.18. Appl., 8.7.16.

A SOLUTION for electrolytic etching contains ammonium chloride, sodium chloride, and iron perchloride or an equivalent, together with a quantity of acid.—L. A. C.

Seal for electric apparatus. F. G. Keyes, East Orange, N.J., Assignor to Cooper Hewitt Electric Co., Hoboken, N.J. U.S. Pat. 1,288,916, 24.12.18. Appl., 7.7.14.

A SEAL for a vacuum container of non-conducting vitreous material is composed of a central copper rod surrounded by, but spaced from, a yielding inner tube of nickel steel welded to an outer platinum tube, the thermal coefficient of the composite tube lying within a region the highest limit of which is equal to the coefficient of expansion of the container material. The copper rod and the tube are united by a metal cap sealed to both.—B. N.

Electro-osmosis; Process and apparatus for emptying the dehydrating cells in removing water by ——. Bergmann-Elektricitäts-Werke A.-G., Berlin. Ger. Pat. 308,014, 16.5.17.

THE dehydrated material is discharged without disturbing the cells themselves, the process being particularly adapted to plant with stationary cells. For example, the dehydrated mass may be forced out of the cells by air or fluid pressure or by means of a jet of liquid, or by a mechanical arrangement. A container is situated on one side of the cells, in which the air is compressed by the pressure of a liquid and when the pressure is released, the air from the container blows the material out of the cells. The material to be dehydrated enters the bottom of a chamber from which it passes directly into the cells and into another chamber at the other end of the cells. The water percolates through the cells and the space between the electrodes becomes filled with the thickened mass. When the cells are full, the inflow of liquid is stopped and the chambers at both ends of the cells are emptied. Compressed air is then admitted from the container at the top of the feed chamber and blows the thickened material into the further chamber, from which it is discharged, the cells being slightly inclined downwards towards the latter chamber.—J. F. B.

Electric furnace. O. Sahlin, London. U.S. Pat. 1,286,794, 3.12.18. Appl., 1.5.15.

SEE Eng. Pat. 115,719 of 1917; this J., 1918, 381 A.

Annealing furnace. U.S. Pat. 1,286,908. See I.

[Fuel] gases. U.S. Pat. 1,286,577. See IIIA.

Sulphuric and hydrochloric acids. U.S. Pat. 1,285,556. See VII.

Cement [insulators]. Eng. Pat. 121,986. See IX.

XII.—FATS; OILS; WAXES.

Oil in oil-seeds; Determination of —. R. Biazzo.
Annali Chim. Appl., 1918, 10, 130—133.

The following rapid process prevents the oxidation of the oil and loss of volatile substances which occur in the usual preliminary drying of oil-seeds before extraction:—About 100 grms. of the seeds is crushed and ground to a fine flour, and a quantity sufficient to yield not more than about 2 grms. of oil is triturated with about three times its vol. of anhydrous copper sulphate, and sufficient calcined sand to give a finely divided friable mass. This is transferred to an extraction thimble, the mortar etc. being rinsed with a little anhydrous sodium sulphate and then with a little of the solvent. The mass is extracted for 3 hours with ether, then re-mixed, and again extracted. The extract is filtered, the solvent evaporated, and the residue dried for 30 mins. at 105° C., with occasional blowing with dry air or, in the case of drying oils, in a current of an inert gas. In the presence of any considerable amount of volatile fatty acids the oil is saponified and the quantity calculated from the mean saponification value.—C. A. M.

PATENTS.

Vegetable oils; Process and apparatus for the oxygenation and polymerisation of —. J. K. Blogg, Surrey Hills, Victoria. Eng. Pat. 122,224, 2.1.18. (Appl. 44/18.)

SEE U.S. Pat. 1,284,572 of 1918; this J., 1919, 81 A. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 2518 of 1879, 11,629 of 1890, 15,440 of 1911, and 5773 of 1912; this J., 1891, 263; 1912, 443; 1913, 475.)

Hydrogenated oil; Product containing —. Hydrogenated-oil composition. C. Ellis, Montclair, N.J. Belssues 14,568, 14,569, and 14,570, 17.12.18, of U.S. Pats. 1,276,509, 1,276,508, and 1,276,507, 20.8.18. Appl., 26.10.18.

SEE this J., 1918, 774 A.

Coconut waste products. Eng. Pat. 116,694. See XIXA.

Coconut butter. Eng. Pat. 117,819. See XIXA.

Treating cottonseed. U.S. Pat. 1,286,389. See XIXA.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Resins. Prins. See XX.

PATENTS.

Lake pigment, and the manufacture thereof. L. E. Barton, Niagara Falls, N.Y., and H. A. Gardner, Washington, D.C., Assignors to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,286,916, 10.12.18. Appl., 28.11.17.

AN organic colouring matter is precipitated upon a white composite pigment comprising a carrier material having coalesced therewith adherent particles of titanic oxide.—C. A. K.

Condensation product and related composition and process of making the same. J. P. A. McCoy, Wilkensburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,286,372, 3.12.18. Appl., 12.4.15.

CONDENSATION products are made from a mixture of equal parts of pyrogallol and gum arabic with 5% of trioxymethylene or other polymer of formaldehyde or substance containing an active methylene group and 50% of a filler, the mixture being heated under pressure or compressed in a hot mould.

—A. B. S.

Phenol-formaldehyde condensation products; Method of making —. J. O. Handy, Assignor to Pittsburgh Testing Laboratory, Pittsburgh, Pa. U.S. Pat. 1,287,299, 10.12.18. Appl., 19.3.18.

A MIXTURE of commercial cresylic acid of 97—99% concentration with more than a molecular proportion of formaldehyde of 40% concentration is boiled without any condensation agent until the solids in the viscous condensation product determined at 110° C. equal or exceed 40% by weight, the final boiling during which water and excess of formaldehyde are removed being at a temperature between 110° C. and 120° C.—D. F. T.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Vulcanisation of — at constant temperature and at a series of increasing temperatures. G. D. Kratz and A. H. Flower. J. Ind. Eng. Chem., 1919, 11, 33—35.

It is found possible to calculate and apply a series of rising temperatures such that the vulcanisation-time curve for any rubber-sulphur mixture may be made a straight line, the slope of which is dependent on the temperatures employed and the amount of catalyst present (compare this J., 1916, 643). To obtain the best physical properties by vulcanisation at constant temperature, sulphur must be present in the mixture in such amount that its active mass is not decreased sufficiently to diminish the rate of reaction appreciably before the desired vulcanisation coefficient is attained. With rubber-sulphur mixtures containing 5% or less of total sulphur, the physical properties of the mixture after vulcanisation at a series of rising temperatures are inferior to those given by vulcanisation at constant temperature; this is true particularly for vulcanisation coefficients of 2.8 or more. For Hevea rubber the optimum vulcanisation coefficient probably lies between 1.7 and 2.8. The coefficients recommended by various authorities are found to be excessive and unless the history of the vulcanisation phenomenon is fully known it is unsafe to judge samples solely on the basis of their sulphur content.—T. H. P.

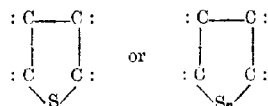
Rubber goods; Determination of free carbon in —. A. H. Smith and S. W. Epstein. J. Ind. Eng. Chem., 1919, 11, 33—36.

ONE gram of the sample, after extraction for 6 hours with acetone and then for 3 hours with chloroform or carbon bisulphide, is transferred to a 250 c.c. beaker and heated on a steam-bath until it no longer smells of chloroform. The residue is treated with a few c.c. of hot concentrated nitric acid and allowed to stand in the cold for about 10 minutes, after which a further 50 c.c. of the acid is added, care being taken to wash down the sides of the beaker. The mass is then heated on the steam-bath for an hour or more until all bubbles or foam disappear from the surface. The hot liquid is poured

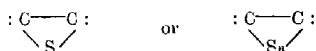
into a Gooch crucible containing a fairly thick pad of ignited asbestos, gentle suction being applied and thorough washing effected with hot concentrated nitric acid. The filter flask is then emptied and the filter washed alternately with acetone and benzene until the filtrate is colourless and afterwards well washed with hot 15% sodium hydroxide solution. The presence of lead is tested for by running warm ammonium acetate solution containing excess of ammonia through the pad into sodium chromate solution; if a yellow precipitate forms, the pad must be washed with the ammonium acetate solution until the washings no longer give a precipitate with sodium chromate. The residue is then washed well with warm 5% hydrochloric acid solution and the crucible dried for 1½ hours in an air-bath at 150° C. The crucible is then weighed before and after the carbon is burned off at a dull red heat. The loss in weight represents approximately 105% (101–108%) of the carbon originally present in the form of lampblack or gas-black. Where the percentage of free carbon is over 10%, only 0.5 gm. of the sample should be used for analysis.—T. H. P.

Terpenes, resins, and rubber; Condensation of unsaturated compounds in relation to —. H. J. Prins. Chem. Weekblad, 1919, 16, 64–74.

CONDENSATION between molecules of the same substance containing the group C : C : is brought about by catalysts such as acids, acid anhydrides, halogens and halogen compounds with active halogen, sulphur and sulphur compounds with active sulphur (persulphides), oxygen and oxygen compounds (peroxides), metallic oxides, and metals. The catalyst and substrate are "reciprocally activated." Three reactions are possible:—polymerisation of the unsaturated substance, combination of catalyst with the substance at the double bond, and combination of catalyst with the polymerised substance formed. The theory of reciprocal activation is discussed in relation to the simultaneous polymerisation and oxidation of unsaturated hydrocarbons, such as terpenes; the formation of resins; and the vulcanisation of rubber. The following theory for the last-mentioned process is suggested. The rubber molecule is rendered active by means of the catalyst sulphur and the sulphur undergoes a change analogous to the formation of ozone from oxygen in presence of unsaturated substances. There then results: (1) a simple polymerisation of the rubber molecule with formation of cyclobutane derivatives, (2) polymerisation of the rubber molecule with simultaneous fixation of sulphur, giving compounds of the type



(3) direct addition of sulphur at the double bond with formation of



—W. S. M.

PATENTS.

Rubber; Method of reclaiming — and apparatus therefor. Dunlop Rubber Co., Ltd., and D. F. Twiss, Birmingham. Eng. Pat. 122,249, 17.1.18. (Appl. 980/18.)

The vulcanised rubber is cut into pieces and submitted to a uniform temperature inside a chamber from which the air has been expelled by steam;

the necessary temperature can be obtained conveniently by surrounding the chamber with a jacket in which a heated heavy oil circulates. For the treatment of solid tyre rubber a temperature of approximately 450° F. (about 230° C.) in the reclaiming chamber is preferred.—D. F. T.

Rubber compound; Manufacture of an improved —. F. H. Broomfield, London. Eng. Pat. 122,310, 4.3.18. (Appl. 3783/18.)

A RUBBER compound with much less tendency to harden at higher temperatures than the rubber compounds commonly used for dielectric purposes, is obtained by vulcanising a mixture of rubber, golden sulphide of antimony and asbestos or mica; black antimony sulphide does not produce the desired result. Suitable proportions are Pará rubber 60, golden sulphide of antimony (containing 17% free sulphur) 14, asbestos or mica powder 16; cables or wires coated with this mixture may be vulcanised by heating for 2 hours at 280° F. (138° C.).

—D. F. T.

[Covering for] electric conductors. Eng. Pat. 122,295. See XI.

XV.—LEATHER; BONE; HORN; GLUE.

Tannins; Effect of hard water on —. T. A. Faust. J. Amer. Leather Chem. Assoc., 1918, 13, 409–417.

CALCIUM sulphate appears to have a precipitating effect on tannins, but other common constituents of hard waters have not been proved to cause any loss in tannin. On account of the salts present, the analysis of tannin solutions made with hard water leads to results showing too high non-tannin content.—F. C. T.

Non-tannin enigma; The —. J. A. Wilson and E. J. Kern. J. Amer. Leather Chem. Assoc., 1918, 13, 429–438.

HIDE powder when shaken with basic chromic chloride or chrome alum solution, before use in tannin analysis, combines not only with chromium, but with the acid. An ionisable collagen salt is formed which is still present even after thorough washing of the chromed hide powder. On the basis of the work of Procter on gelatin-acid equilibria (this J., 1916, 645) it can be shown that the presence of sulphate ions in the hide powder will cause a lessened concentration of electrolytes in the absorbed part of any electrolyte solution with which the hide powder is shaken. The external liquid will show a corresponding increase in concentration. This assumes that the electrolyte does not combine with hide powder. Thus the analysis of a tanning material containing such electrolyte non-tannins will show too high a result for non-tannins. As an example, a 1% potassium sulphate solution increased in concentration to 1.046% after shaking with chromed hide powder. A similar result in the case of non-electrolytes which do not combine with hide powder (e.g., glucose) is due to the salting-out effect of the ions of the collagen sulphate. In the case of a substance which combines with hide powder, its uncombined portion will tend to raise the non-tannin content, whilst the combined portion will act in the opposite sense.—F. C. T.

Tan liquors; Effect of impure kaolin on the determination of acid in —. D. McCandlish and F. B. Lederer. J. Amer. Leather Chem. Assoc., 1918, 13, 570–572.

QUANTITIES of from 5 to 50 c.c. of N/10 acetic acid were diluted to 250 c.c. giving solutions containing from 0.012 to 0.12 gm. of acid per 100 c.c., and therefore comparable in acidity with tan liquors.

each case 15 grms. of kaolin was added, the mixture shaken and allowed to settle. Portions for titration were withdrawn after standing for 20 minutes and for 1 hour, and titrated with *N*/10 lithium hydroxide using Grüber's hematine as indicator. There was a loss of acid in each case, varying from 92% in the case of the weakest acid to 33% in the case of stronger acid. This was after minutes' standing. This loss of acid is attributed to impurity in the kaolin, due to imperfect washing of acid in manufacture. The kaolin was found to contain iron, which seriously interfered with the titration in the case of the stronger acids. The authors suggest the following test of the quality of kaolin: 15 grms. of kaolin is shaken with 250 c.c. *N*/50 acetic acid and allowed to stand for one hour, after which 50 c.c. of the acid is withdrawn and titrated with *N*/10 sodium hydroxide, using maline as indicator. 10 c.c. of alkali should be necessary, and the end-point characteristic.

—F. C. T.

Humic acid; Absorption of — in sole leather manufacture. A. Rogers. J. Amer. Leather Chem. Assoc., 1918, 13, 520–527.

SAMPLES of both leather and tan liquor were taken at different stages of sole leather tanning, and analyses made to determine the absorption of tannin by the hide and the diminution in strength of the liquors. Half the total absorption of tannin was effected in the first 15 days, and four-fifths after 62 days more. 62 days were required for the absorption of the remaining one-fifth of the tannin.

—F. C. T.

Humery waste waters; Profitable recovery of proteids [for manufacture of fertilisers] from —. C. L. Peck. J. Amer. Leather Chem. Assoc., 1918, 13, 417–428.

AN alkaline effluent from the lime-yard, etc., is screened, passed through settling tanks to remove dissolved lime and other inorganic matter, and then mixed with acid spent tan liquors in a reaction tank. By this means proteids are precipitated and may be run off as a sludge containing 95% of water. The sludge is air-dried until the moisture content is not more than 30%. The screenings are also nitrogenous and, like the sludge, are saleable after drying for the manufacture of fertilisers.

—F. C. T.

PATENTS.

Leather; Process of manufacturing a substitute for —. A. Meier, Schmargendorf, and H. Rall, Karlshorst, Germany, Assignors to Ges. für Verwertung Chem. Produkts m. b. H., Berlin. U.S. Pat. 1,287,387, 10.12.18. Appl., 12.2.15.

LEBUMINOUS material is treated with a mineral tanning agent and then with an organic tanning agent, and finally with formalin.—W. F. F.

Glue and the like; Making —. R. W. Mumford, New York, Assignor to Refining Products Corporation, Wilmington, Del. U.S. Pat. 1,289,053, 24.12.18. Appl., 30.6.17.

FOR the production of clear, decolorised glue, a solution of gelatinous animal matter is agitated with porous vegetable carbon of open texture, possessing nearly the same cellular structure as that of the material from which it was made. Kieselnähr may also be added. The purified solution is then further concentrated.—C. A. K.

Tanning medium. A. Turnbull and T. B. Carmichael, Liverpool. U.S. Pat. 1,288,458, 17.12.18. Appl., 16.7.17.

See Eng. Pat. 110,470 of 1917; this J., 1917, 1244.

XVI.—SOILS; FERTILISERS.

Organic phosphorus of soil; Experimental work on methods for extraction and determination of —. C. J. Schollenberger. Soil Sci., 1918, 6, 365–395.

THE author gives very full details for the estimation of inorganic and total phosphorus in the soil, using Neumann's wet combustion method for the latter. The procedure best adapted for obtaining an ammoniacal extract of the soil which contains the minimum of clay and the maximum amount of phosphorus, consists in filtering the extract through a layer of the soil itself in a Buchner funnel. The most satisfactory strength of ammonium hydroxide for the extraction is 4–6%, 400 grms. of soil being shaken for 2–8 hours with 1 litre of this solution; the filtration takes 1–3 days. For the preliminary removal of the bases from the soil, prior to the extraction with ammonia solution, it is recommended to wash with 1% hydrochloric acid until no calcium can be detected in 50 c.c. of the filtrate and then to wash out the acid with a saturated solution of carbon dioxide. Sodium and potassium hydroxides are no more efficient than ammonia solution in extracting organic phosphorus from the soil, and one extraction by ammonia, using the proper procedure, removes from the soil practically all of the organic phosphorus that is capable of being taken into solution. No constant relation was observed between total organic matter and organic phosphorus in ammoniacal extracts, although there was a general tendency for these to vary together. The inorganic phosphorus of soils adsorbed by organic or inorganic colloids is not included in the apparent organic phosphorus content determined by the methods described. It is found that the humus and organic phosphorus, the colour of the ammoniacal extracts, and the total nitrogen in the four depths of soil, 0"–6", 6"–12", 12"–18", and 18"–24" are in the same relative proportions in each layer.—W. G.

Phosphate; Effect of sulphofication and nitrification on rock —. J. W. Ames and T. E. Richmond. Soil Sci., 1918, 6, 351–364.

IN an acid soil the oxidation of free sulphur proceeds vigorously, and is somewhat depressed by the addition of calcium carbonate, whereas the latter is essential for "sulphofication" in sand cultures. In an acid soil, in the absence of calcium carbonate or nitrogen carriers, the oxidation of sulphur incorporated with rock phosphate causes a considerable portion of the phosphorus to be converted into a readily available form. In the presence of calcium carbonate, however, the acidity resulting from the sulphofication being neutralised, there is practically no breaking down of the rock phosphate. The presence of ammonium sulphate and the nitrification of either ammonium sulphate or dried blood have no appreciable action on the breaking down of rock phosphate in the soil, and nitrification is only stimulated to a very limited extent by the presence of rock phosphate.—W. G.

Nitrogenous fertilisers; Experiments with various —. E. A. Mitscherlich, S. v. Saucken, and F. Iffland. J. Landw., 1918, 66, 187–198.

EXPERIMENTS on sand-cultures of oats show that urea and its nitrate are at least equivalent to the other ordinary nitrogenous fertilisers, the nitrate

forming an excellent top-dressing, for which purpose it may replace sodium nitrate. (See also J. Chem. Soc., Mar., 1919.)—T. H. P.

Seed germination; Effect of certain organic substances on —. E. B. Fred. Soil Sci., 1918, 6, 333–349.

THE results of experiments on the effect of alfalfa, casein, peptone, and sugar on the germination of a considerable number of different types of seeds indicate that, unless used in very large quantities, the three nitrogenous substances do not seriously affect seed germination. They are thus far less injurious on the basis of nitrogen content than is green manure. The decrease in germination caused by excessive amounts of casein or alfalfa powder is not lessened by the application of calcium carbonate. Sugar retards the rate of seed germination and at the same time increases bacterial growth. In large amounts it also decreases the percentage of germination. Sterilisation of the soil often inhibits the rate of seed germination.—W. G.

Proteids [for fertilisers] from tannery waste waters. Peck. See XV.

PATENT.

Superphosphate; Apparatus for use in manufacture of —. T. Hill and C. H. Eden, Swansea. Eng. Pat. 122,039, 14.1.18. (Appl. 815/18.)

AN open, cylindrical "den," for the reception of liquid superphosphate, has a movable base consisting of a closed, floor-like portion and a wire or blade cutter portion, either portion being capable of covering the whole opening; and is also provided with a vertical plunger. On solidification of the liquid charge in the receptacle, the base is moved horizontally until the cutter portion is in position, when the plunger is operated and the material pressed through the cutter openings.—W. E. F. P.

XVII.—SUGARS; STARCHES; GUMS.

Sugar manufacture; Development of nitrogenous colouring substances during —. C. A. Oudemans, De Suikerind., 1918, 384; Archief Suikerind. Nederl.-Indië, 1918, 26, 1686–1694.

DURING sugar manufacture, whether from the cane or beet, there may be a development of colour from three different causes, namely (1) the action of lime upon the reducing sugars, (2) caramelisation on heating and evaporating, and (3) the reaction between reducing sugars and amino-acids or their derivatives (*cf.* Maillard, this J., 1912, 144). Experiments by the author showed that when mixtures of 0.5 grm. of glutamic or aspartic acid, glutamine or asparagine, 1 grm. of invert sugar or sucrose, and 15 c.c. of water were heated to 115° C. after neutralising, intensely dark-coloured products were formed, which were precipitated by basic lead acetate, and insoluble for the greater part in alcohol. Parallel tests in which the amino-acid or its derivative was absent gave a much smaller production of colour, and the coloured substances were readily soluble in alcohol. Cane juice as it comes from the mills already possesses a degree of colour (*cf.* Zerbán, this J., 1918, 778 A), but most of the colour developed subsequently during the course of manufacture is considered by the author to be due to the presence of amino-acids and their derivatives, particularly asparagine.—J. P. O.

Gentiobiose and the two β -glucosides of glycol; Simultaneous biochemical synthesis of — by emulsin. E. Bourquelot and M. Bridel. Comptes rend., 1919, 168, 253–256.

FROM the products of the action of emulsin from almonds on a mixture of dextrose and glycol in the molecular proportion of 2:1 in aqueous solution, the authors have isolated and characterised gentiobiose, glycol β -glucoside, and glycol β -diglucoside.

—W. G.

PATENTS.

Sugar industry; Apparatus for separating slimy and solid matters in the —. R. Kujawski, Milejow, Poland. Ger. Pat. 308,062, 9.5.12.

THE material is stirred in a closed vessel with a sieve bottom, while subjected to the action of compressed air, steam, or vacuum. The prongs of the agitator arms are arranged at an angle and their inclination is in an opposite sense on consecutive arms. The sieve floor of the containing vessel is carried on girders which form separate outflow chambers, and movable troughs can be introduced under the outflow chambers in order to catch the juice flowing through for the purpose of testing it.

—J. F. B.

Sucrose; Process for inverting —. C. Petzold, Zwickau. Ger. Pat. 308,850, 17.6.17.

AIR is introduced into the liquid undergoing inversion and is brought into intimate contact therewith by means of revolving combs with fine teeth or by devices resembling brushes, situated inside the inversion vessel. The oxygen is stated to have an intensifying effect on the inversion, so that this may be produced by a smaller proportion of acid and at a lower temperature (about 75° C.), thereby avoiding undesirable secondary modifications of the sugar. The oxygen also has a favourable influence on the colour of the product.—J. F. B.

Glucose; Process of manufacturing — [from maize cobs]. F. B. La Forge, Washington, D.C. U.S. Pat. 1,288,420, 17.12.18. Appl., 13.4.18. (Dedicated to the public.)

COBX (maize) cobs are treated with dilute sulphuric acid and the insoluble portion is separated, washed free from acid and soluble matter, and then dried and finely ground. The powder is mixed with about an equal weight of 75% sulphuric acid and after standing for several hours is diluted with a large quantity of water, and heated until hydrolysis is complete. The liquor, after separation of insoluble matter by filtration, is neutralised with slaked lime, the calcium sulphate filtered off, and the resulting solution concentrated to a syrup from which glucose separates in crystalline form.

—L. A. C.

Decolorising carbon. U.S. Pats. 1,286,187 and 1,287,592. See IIb.

XVIII.—FERMENTATION INDUSTRIES.

Yeasts from thin beers, and their "working power." F. Schönfeld and C. Goslich. Woch. Brau., 1918, 35, 201–203.

YEASTS obtained in the fermentation of brewer's worts of low gravity, *e.g.*, 6%, were found to possess a greater "working power" than those from worts of full gravity. This is attributed to the practice of arresting the vat fermentation of thin worts at an earlier stage than is usual with normal worts. The yeast is accordingly in a very

vigorous condition; its protein-content, in spite of the low gravity of the worts, is high, and this is generally indicative of high "working power."

—J. H. L.

Maltase, its capacity for penetrating the wall of the yeast cell, and its dependence on the cultivation of the yeast in light and heavy worts. F. Schönfeld, H. Krumhaar, and M. Korn. *Woch. Brau.*, 1918, 35, 181—182.

The diffusion of maltase from yeast cells into the surrounding medium can only take place when the cells have been killed or ruptured. It was found that killing by means of toluene does not enable the maltase to escape from all types of yeast; among the exceptions observed were the bottom-fermentation races K. U and M. The maltase-activity (cp. this J., 1918, 161A) of yeasts grown in thin worts was found to be lower than that of yeasts from worts of normal gravity.—J. H. L.

Beers; Preparation of thin — by dilution, and the question of decarbonation. F. Schönfeld. *Tageszeit. für Brauerei*, 1918, 16, 243. *Z. ges. Brauw.*, 1918, 41, 198.

In the preparation of thin beers by fermenting worts of normal gravity and diluting afterwards, the presence of carbonates in water used for the dilution is of no practical importance where the dilution is carried out after the secondary fermentation, i.e., on the fully conditioned beer. The only case where decarbonation might be advisable is where dilution is effected just after the primary fermentation and where a vigorous secondary fermentation is desirable; in such a case a high proportion of carbonates in the added water might weaken the yeast during the secondary fermentation. (See also Krumhaar, this J., 1918, 779A.)—J. H. L.

B. coli; Medium with autolysed yeast water for the culture of —. F. Diéert and A. Guillard. *Comptes rend.*, 1919, 168, 256—257.

500 GRMS. of pressed brewers' yeast is heated at 50° C. for 24 hours, at the end of which time it is completely liquefied. This liquid is diluted to 2 litres, boiled for $\frac{1}{2}$ hour, filtered, and further diluted to 7.5 litres. This autolysed yeast gives a medium very constant in composition and can be used quite satisfactorily to replace peptone bouillon for the culture of *B. coli*.—W. G.

Biochemical synthesis of gentiobiose, etc. Bourquelot and Bridel. See XVII.

PATENTS.

Alcohol-reduced beverages; Process of making —. H. Heuser, Chicago, Ill. U.S. Pat. 1,286,315, 3.12.18. Appl., 24.2.17.

A CHANGE of an alcoholic beverage, e.g. beer, is made to flow in a continuous film through a boiling-zone on the inner surface of a vacuum pan while steam under pressure is diffused over the opposite surface of the pan, so as to boil the liquid film momentarily and instantaneously to evaporate alcohol therefrom. The area of the boiling-zone over which the liquid flows may be varied by regulating the area to which steam is applied.—J. F. B.

Producing nitrates by means of bacteria. U.S. Pats. 1,286,938—9 and 1,288,754—1,288,756. See VII.

XIXa.—FOODS.

PATENTS.

Drying goods such as wheat, fruit, vegetables, or fish; Method of and apparatus for —. J. Westerbeeck, and N. V. "Technéma," Rotterdam. Eng. Pat. 111,112, 8.11.17. (Appl. 16,369/17.) Int. Conv., 21.3.14.

THE material to be dried is delivered by a conveyor on to a horizontal platform at the top of a tower formed of a number of perforated horizontal sections each mounted on horizontal pivots just below. A number of such platforms are provided in the tower, one below the other, and all the sections forming a platform are connected to a reciprocating mechanism, by which they are simultaneously turned through 90° into a vertical position. Those forming the platform next below may then be turned through 90° in the opposite direction, and so on. The material thus passes from one platform to the next in a series of small heaps which are alternately spread out on their opposite sides on successive platforms and separated by uncovered spaces. The drying gas passes upwards through the platforms and also through adjustable openings in the side of the tower throughout its height. The gas may be withdrawn through openings on the opposite side of the tower between each pair of platforms, so that moist air may be withdrawn without passing through the whole of the platforms. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 1701 and 3976 of 1868, 8942 of 1901, and 17,740 of 1910; this J., 1902, 695.)—W. F. F.

Cocoa and the waste products of chocolate manufacture; Processes for treating —. [Recovery of theobromine, caffeine, and fat.] E. de Groussseau and A. Vicogne, Cliehy, France. Eng. Pat. 116,694, 27.4.18. (Appl. 7094/18.) Int. Conv., 11.6.17.

THE material, principally waste products, is heated at 100° C. for 1 hr. with water containing 3 to 4% of sulphuric, hydrochloric, or acetic acid, then neutralised with an alkaline-earth carbonate (e.g., magnesium carbonate), and dried at 100° C. The dry powder is extracted with hot tetrachloroethane: the extract is distilled to remove the solvent and the residue, consisting of fat, theobromine, and caffeine is treated with carbon tetrachloride which dissolves the fat and caffeine. The solution is filtered to separate the insoluble theobromine, the filtrate is distilled and the caffeine extracted from the residue with hot water. The caffeine crystallises out when the aqueous solution is cooled; the theobromine may be re-crystallised from boiling water.—W. P. S.

Coconut butter; Process for the extraction of —. E. E. R. Gaudart, Paris. Eng. Pat. 117,819, 27.7.18. (Appl. 12,254/18.) Int. Conv., 28.4.17.

KERNELS of fresh coconuts are reduced to small fragments and then ground in a runner mill with a quantity of "skimmed coconut milk" (obtained in a later operation) at 30° C. The milky and fluid mixture is filtered through coarse cloth and then centrifuged to separate resinous substances in suspension. The liquid is delivered into a centrifugal cream-separator, the "cream" obtained is pasteurised, submitted to lactic fermentation for 12 hrs. at 25° to 30° C., and then churned at 15° C. The "butter" is washed and kneaded in the usual way. A portion of the liquid ("skimmed coconut milk") separated from the "cream" is reserved

for working up a further charge of kernels, and the remainder is stirred and heated with the addition of calcium sulphate, 500 grms. of this being added to every 1000 litres of "skimmed milk"; the proteins are thus precipitated, and are collected, washed, and dried.—W. P. S.

Cottonseed meats, hulls, and lint; Method of and apparatus for treating a mixture of — J. S. Mullen, Richland, Ga. U.S. Pat. 1,286,389, 3.12.18. Appl., 13.7.16.

The mixture is passed over an inclined screen to separate the fine meal, and the coarser portion, as it falls from the lower edge of the screen, passes in front of a suction nozzle which removes the hulls and lint. A deflecting plate prevents passage of finer material into the nozzle. The suction is regulated so as to vary the amount of hulls removed, and thus to alter the protein and ammonia content of the meal as desired.—W. P. S.

Food product; Flaked cereal — and method of making the same. W. H. Post, Assignor to Postum Cereal Co., Battle Creek, Mich. U.S. Pat. 1,286,766, 3.12.18. Appl., 6.4.17.

Corn (maize) grits are cooked with wheat bran, and the product is submitted to a flaking operation so as to embed the bran in the surface of the flakes, which are then sprayed with a sugar solution. Additional bran is added to the flakes, and the whole is toasted.—J. H. J.

Baking powder and process of making same. E. C. Atkinson, Indianapolis, Ind. U.S. Pat. 1,286,904, 10.12.18. Appl., 20.8.17.

The particles of the active constituent of a baking powder are coated with hydrogenated corn (maize) oil by mixing with the molten fat, spraying the mixture, and cooling the spray as it falls.—J. H. P.

Leavening agent. F. B. La Forge, Washington, D.C. U.S. Pat. 1,288,428, 17.12.18. Appl., 13.4.18. (Dedicated to the public.)

A LEAVENING agent is prepared by mixing sodium bicarbonate with gulonic lactone.—L. A. C.

Eggs; Preserving — G. Fütterer, Chicago, Ill. U.S. Pat. 1,286,989, 10.12.18. Appl., 24.11.17.

Eggs are dipped in a mixture of beeswax, 5, and lard, 95 parts, heated at 203° F. (95° C.); the excess of the mixture is then removed and the remainder allowed to solidify on the shells to form a bacteria-excluding coating.—W. P. S.

Food product of milk; Process of making a new — P. W. Turney, Richmond, Va. U.S. Pat. 1,289,021, 24.12.18. Appl., 19.4.18.

FRESH milk is curdled by means of an enzyme until the precipitate is of a flocculent, slightly adherent consistency. Further curdling is prevented by rapidly lowering the temperature, and the mass is agitated to facilitate separation of the whey. The precipitate is then allowed to settle and the whey poured off and concentrated to about one-fourth of its bulk. The concentrated whey is mixed with the precipitate, and the mixture maintained at a low temperature to prevent further action.

—L. A. C.

Gluten; Process for drying — G. A. Olson, Pullman, Wash., Assignor to the Government and People of the United States. U.S. Pat. 1,289,883, 31.12.18. Appl., 23.12.15.

A QUANTITY of gluten is rolled into a solid mass under hot water, and placed in an oven heated to a temperature slightly below 100° C., the pressure being reduced at first so as to allow the gluten to expand, and afterwards increased to that of the atmosphere.—A. R. S.

Milk; Dried — and method for producing the same. C. H. Campbell, Assignor to Borden's Condensed Milk Co., New York. Reissue 14,567, 17.12.18, of U.S. Pat. 1,233,446, 17.7.17. Appl., 6.9.18.

SEE this J., 1917, 1025.

XIXB.—WATER PURIFICATION; SANITATION.

Boiler feed water; Linseed process for softening — R. Heuss. Z. ges. Brauw., 1918, 41, 200—201.

THE Brun process for preventing incrustation by introducing linseed extract into boilers (this J., 1910, 76) was tested by E. Hohn on behalf of the Swiss Association of Boiler Proprietors. Examination of the contents of the boilers after working showed satisfactory results in most cases, the salts precipitated from the water being present in the form of a sludge. The fatty matters of the linseed appeared to have been volatilised with the steam, for very little free or combined fatty acid was found in the boilers; and the organic matter remaining in them exerted no pronounced corrosive action. Whilst the process appears to have no harmful effect on the boiler it is possible that the fatty matters entrained by the steam may give rise to corrosion elsewhere, e.g., in the condensed water pipes, and until the results of its working over a long period are known the process cannot be recommended.—J. H. L.

Waters; Methods of analysis of — A. A. Bado, V. J. Bernola, A. P. Mazza, and L. Dasso. Obras Sanitarias de la Nación, Buenos Aires, 1918. [Reprint.]

THIS monograph gives a detailed description of the methods adopted in the *Laboratorio de Análisis de Aguas y Ensayos de Materiales de las Obras Sanitarias de la Nación* of Buenos Aires for the complete chemical and microbiological analysis of potable waters.—W. S. M.

Atmospheric nitrogen and oxygen; Determination of the rate of solution of — by water. W. E. Adeney and H. G. Becker. Sci. Proc. Roy. Dublin Soc., 1918, 15, 385—404.

THE rate of solution of atmospheric oxygen and nitrogen has been determined by allowing a large bubble of air to rise slowly through a narrow column of water. This method of bringing the air and water into contact ensures the presentation of the air to a continually changing water surface and also effectual local stirring of the water. The results confirm the authors' theory of the mechanism of the solution of air by water, which is that absorption occurs at the surface and then, under gravitational forces, the air-charged layer descends through the solution and a second surface is presented to the air.—J. F. S.

Culture of B. coli. Diéret and Guillard.
See XVIII.

PATENTS.

Sewage; Apparatus for aerating —. A. M. Brosius, Pasadena, Cal. U.S. Pat. 1,286,520, 3.12.18. Appl., 28.8.16.

SEWAGE is introduced into a tank which is provided with a pipe for blowing in air, and a paddle arrangement for mixing the air and sewage to form a foam. The air may be introduced also along with the sewage through a pipe opening at the bottom of the tank, the mixture being mechanically broken up into a foam which is expelled into the tank.

—J. H. J.

[*Sewage*] *sludge; Device for activating* —. L. E. Rein and J. W. Cox, Assignors to Pacific Flush Tank Co., Chicago, Ill. U.S. Pat. 1,286,775, 3.12.18. Appl., 6.10.16.

A SEWAGE tank with an overflow outlet is provided with a pump, the inlet of which extends into the tank, while the exhaust has a return pipe attached to it carrying an injector which is adapted to inject air into the return pipe. The return pipe has a deflector guide at its outlet, adapted to deflect the discharge into the body of the sewage.—J. H. J.

Disinfectant. A. A. Wells, Montclair, N.J. Reissue 14,502, 10.12.18, of U.S. Pat. 1,280,602, 1.10.18. Appl., 7.11.18.

See this J., 1919, 27 A.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Stramonium leaves; Influence of the presence of stems and roots upon the total alkaloid content of —. G. P. Koch. Amer. J. Pharm., 1919, 91, 11–16.

OF the whole stramonium plant, the leaves constitute about 41%, the stems 44%, and the roots 15%. The leaves yield from 0.398 to 0.596% of total alkaloids, the stems 0.080 to 0.600%, and the roots 0.160 to 0.319%. The whole plant (leaves, stems, and roots) can, therefore, be harvested and used for the commercial preparation without risk of the total alkaloid content falling below 0.25%, the requirement of the U.S. Pharmacopœia.—W. P. S.

Guttameter; The — and its use for the examination of drugs and poisons. F. Eschbaum. Ber. deuts. pharm. Ges., 1918, 28, 337–416.

The guttameter is a capillary pipette with a rubber bulb above and a wide delivery orifice of 8.627 mm. diameter, the instrument being constructed to deliver, at 20° C., 10 drops of water weighing approximately 1.200 grm. The interior having been cleaned with chromic acid mixture and rinsed out with the liquid to be examined, it is charged with liquid and the total absence of air bubbles is confirmed. Ten drops are then delivered into a weighing bottle and the weight ascertained. This weight is then corrected by the factor of the instrument to bring it to that corresponding to a standard of 1.2 grm. of water. The results are directly proportional to the surface tension of the liquid and are inversely proportional to the results found by the stalagmometer. The author has used the instrument for the investigation of an observation by Traube and Onodera (this J., 1915, 509) that

the physiological activities of alkaloid solutions are generally related to their surface properties. Incidentally it was found that the guttameter could be applied for detecting the decomposition of solutions of quinine hydrochloride on storage in glass bottles. Quartz or Jena glass was established as the best material for keeping these solutions. A series of solutions of alkaloids of the quinine group have been studied. Increasing proportions of sodium carbonate were added to 0.1% solutions of the alkaloid salts, and the decrease in surface tension thus produced was measured. The lower the surface tension, the higher the toxicity of the alkaloid. Quinine and quinidine were about equally toxic; the other alkaloids were grouped, according to this manner of classification, in the following order of increasing toxicity: hydroquinine, ethylhydrocupreine, ethylapohydroquinidine, isoamylhydrocupreine and iso-octylhydrocupreine. In Traube's investigation it was found that morphine and apomorphine salts, when treated with sodium carbonate, did not lower the surface tension of water; this exceptional behaviour is confirmed by the author, but he found that by treatment with ammonia in certain proportions, the morphine could be obtained in a disperse form which had the expected surface activity.—J. F. B.

Tinctures and fluid extracts; New method for determination of extract in —. F. Eschbaum. Ber. deuts. pharm. Ges., 1918, 28, 417–419.

THE difficulty of obtaining concordant and accurate results in determining the solid matters in tinctures and fluid extracts by ordinary methods of drying may be overcome by drying the liquid on filter paper. A strip of filter paper, 20 cm. long and 6–7 cm. wide, is folded over to the extent of about 5 mm. along both its longitudinal edges, then rolled up and inserted in a metal ring. The roll is dried in the oven at 108° C. and weighed in a weighing bottle. The paper is unrolled and clipped at both ends in a pair of clamps, 5–6 cm. broad, supported over a hot plate. A measured quantity, 2–5 c.c., of the tincture is then distributed over the paper from a pipette, and when the liquid has evaporated the paper is again rolled up, dried in the oven, and weighed. On account of hygroscopicity the weighings must be made as quickly as possible and the loss of time in cooling may be avoided by employing a weighing bottle with a vacuum jacket and weighing immediately after removing the paper from the oven.—J. F. B.

Acetylsalicylic acid. H. L. Dahm. J. Ind. Eng. Chem., 1919, 11, 29–30.

AN apparatus is described which overcomes the difficulty of determining the melting point of acetylsalicylic acid caused by the progressive decomposition of the acid when gradually heated. A 250 c.c. (CO) flask is filled with paraffin oil which is stirred by a motor-driven propeller. A standardised thermometer graduated to 0.2° C. and provided with an air-jacket for protection against draughts, is immersed permanently in the oil-bath to a depth of 3 inches, for which immersion it is calibrated. The capillary melting point tube is attached by means of two rubber bands to a glass rod sliding through a clamped cork. The temperature of the bath is raised, with constant stirring, at a uniform rate of 1° per minute to 120° C., the melting point tube being then immersed in the oil. By this method samples of aspirin from various sources were found to melt within the range, 133°–135° C. (corrected). For determining the approximate proportions of free salicylic acid in aspirin a series of standard colours was prepared from a solution of 10 grms. of $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ in 50 c.c. of water

and 5 c.c. of 10% hydrochloric acid, the liquid being then diluted to 100 c.c. This solution was diluted with water in the following proportions:

C.c. of solution	C.c. of water	% of $\text{CoCl}_2 + 2\text{H}_2\text{O}$	Colour No.	Grms. of salicylic acid in equal volumes
5	395	0.125	0	0.00005
10	390	0.25	1	0.0001
10	190	0.50	2	0.0002
10	90	1.00	3	0.00025
10	75	1.50	4	0.0003
10	65	2.00	5	0.00035
10	40	2.50	6	0.0004

The standards thus obtained are preserved in glass-stoppered bottles of uniform size and holding about 25 c.c. of liquid. They were standardised by using a 0.1% solution of salicylic acid, a definite volume of this being mixed with 5 c.c. of alcohol and diluted to a final volume of 25 c.c.; one drop of 10% ferric chloride solution was then added. After standing for 5 minutes in a flask similar to those holding the cobalt chloride solutions, the colour was matched against these. In this way the results given in the last column of the table were obtained. Such results are accurate only for definite experimental conditions.—T. H. P.

Iodine; Churchill's tincture of —. H. C. Raubenheimer. Amer. J. Pharm., 1919, 91, 37—44.

THE present method of preparing this tincture (U.S.A. National Formulary, IV., 1916) is unsatisfactory owing to a deficiency in the quantity of potassium iodide used; particles of undissolved iodine are present. It is recommended that the potassium iodide be increased from 3.3 to 3.85 grms. The quantities would then be:—Iodine, 165 grms.; potassium iodide, 3.85 grms.; water, 25 c.c.; alcohol, sufficient to make 100 c.c.—W. P. S.

Recovering volatile inflammable solvents. Sestini. See I.

Gentlobiose and glycol-glucosides. Bourquelot and Bridel. See XVII.

Terpenes. Prins. See XIV.

PATENTS.

[*Halogen*] compounds [of hydrocarbons]: Preparation of — by the action of light. W. O. Snelling, Pittsburgh, Pa. U.S. Pat. 1,285,823. 26.11.18. Appl., 1.7.13.

A GASEOUS mixture of the halogen and hydrocarbon is exposed to actinic light of gradually increasing intensity by passing it towards the source of illumination through a transparent vessel divided into a series of communicating compartments by means of transparent, vertical partitions.—W. E. F. P.

Pinacone; Process for the manufacture of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 306,523, 4.2.17. Addition to Ger. Pat. 252,759.

PINAONE is prepared by the electrolytic reduction of acetone in acid solution, using electrodes composed of lead containing 2% or more of Cu. The yield of pinacone is thereby increased and that of the valueless isopropyl alcohol diminished. For instance, according to the original process the ratio of pinacone to isopropyl alcohol is about 2:1, whereas with lead cathodes containing 4% Cu the ratio is raised to about 20:1.—J. F. R.

Hydrogenised compounds; Manufacture of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 306,724, 7.10.15. Addition to Ger. Pat. 305,347 (this J., 1918, 487 A).

AROMATIC isocyclic or heterocyclic compounds other than bases are treated with alkali or alkaline-earth metals and alcohols in the presence of indifferent solvents. In this process ethyl alcohol may be employed instead of amyl alcohol and the violence of the reaction is controlled by the inert solvent.—J. F. R.

Bacteria preparations; Permanently-stable dry — and process of making same. E. Helbig, Frankfurt, Assignor to Farb. vorm. Meister, Lucius, u. Brünig, Höchst, Germany. U.S. Pat. 1,288,582. 24.12.18. Appl., '28.6.15.

SEE Ger. Pat. 291,405 of 1914; this J., 1916, 654. Special claim is made for a tuberculin preparation made by the process described.

Halogen products of hydrocarbons; Process of manufacturing —. B. S. Lacy, Sewaren, N.J., Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,286,353. 3.12.18. Appl., 6.10.15.

SEE Eng. Pat. 101,708 of 1916; this J., 1917, 1063.

Cocoa waste products. Eng. Pat. 116,694. See XIXA.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

PATENTS.

[*Photographic*] toning process and product thereof. E. R. Bullock, Assignor to Eastman Kodak Co., Rochester, N.Y. U.S. Pat. 1,286,890, 3.12.18. Appl., 20.6.17.

A SILVER image is converted into silver sulphide and then treated with a solution of a salt of seleno-sulphuric acid, the residual image being reddish in tone and containing compounds of silver, sulphur, and selenium.—B. V. S.

Photographic printing process. J. E. Thornton, London, Assignor to J. O. O'Brien, Manchester. U.S. Pat. 1,288,753, 24.12.18. Appl., 30.6.15.

A HALF-TONE negative is obtained in the usual way from the original full-tone negative, and from this is obtained a positive by the carbon process. In a three-colour film, three such positives, suitably coloured, are superimposed in register.—B. V. S.

XXIII.—ANALYSIS.

Specific heat determinations at higher temperatures. W. P. White. Amer. J. Sci., 1919, 47, 44—59.

WHEN determining the specific heat of a solid substance by the method of mixtures, the chief discrepancies are due to:—(1) The temperature determination in the furnace; (2) the loss of heat in dropping the material into the calorimeter; (3) exposure of the calorimeter to the outer air during the drop; (4) the effect of external conditions (jacket or electrical measuring system) on the calorimeter after the drop; (5) internal effects (temperature change) in the calorimeter after the drop. The most serious of these errors is that

due to the loss of heat in transferring the hot body to the calorimeter. A simple form of automatic drop is desirable, and the author has successfully used a container hung on a latch, which is released by pulling a fine wire; the container then falls into a gauze tube fitted with a tin-foil rim, this tube sinking with the hot body into the water with a minimum of splash and without any escape of steam. A much longer time than is usually allowed—about 20 minutes—is needed before the hot body and the water in the calorimeter are in equilibrium. Many of the discrepancies observed when water is used may be avoided by replacing it by a block of copper, but this greatly increases the time required for a determination and is very exacting in regard to the control of the temperature of the jacket. (See also J. Chem. Soc., Feb., 1919.)—A. B. S.

Calcium and magnesium; Estimation of — in different saline solutions. E. Canals. Bull. Soc. Chim., 1918, 23, 422–430.

The simplest and most satisfactory method of estimating calcium in its solutions is to precipitate it as calcium oxalate by the addition of oxalic acid to the slightly acid boiling solution, followed by the addition of ammonia in slight excess. The excess of ammonia is subsequently removed by boiling. The precipitate is washed with hot water, dried, ignited, and weighed as calcium oxide. The method of estimation by precipitation and weighing as calcium sulphate is very exact if certain precautions, as to the amount of acid used for the precipitation, dilution of the alcohol used for washing, time of ignition, etc., are observed.—W. G.

Gold; Quantitative determination of — especially in animal tissues. S. M. Cadwell and G. Leavell. J. Amer. Chem. Soc., 1919, 41, 1–12.

SMALL amounts of gold (0.03–3.0 mgrms.) present in animal tissues can be estimated with a maximum error of 0.05 mgrm. by the following process: 10 grms. of fresh tissue is placed in a 300 c.c. Kjeldahl flask, treated with 10 c.c. each of concentrated sulphuric and nitric acids and digested over a free flame until the cooled solution is colourless. Air is then blown into the flask and the mixture again heated until the volume is reduced to 2 c.c.; this procedure removes the sulphuric acid. One c.c. each of hydrochloric and nitric acids is added and the mixture boiled for a few minutes and a further 1 c.c. of hydrochloric acid added. The solution is cooled, diluted with 5 c.c. of water, and concentrated ammonia added until the colour is discharged and then an excess of 2 c.c. The mixture is boiled and the white precipitate which forms at this point dissolved by adding 5 c.c. of concentrated hydrochloric acid and boiling for 3 minutes. The solution is filtered through asbestos on an alundum plate and the filtrate treated with excess of ammonia. The volume of the solution should now be about 40 c.c.; 1.1 c.c. of 85% phosphoric acid and 0.75 gm. of disodium hydrogen phosphate are added and the solution electrolysed using a rotating anode and a platinum sheet cathode. The difference of electrode potential should be 0.9–1.2 volts and the temperature 60° C. The method has been slightly modified to allow of its use for larger quantities of gold. By the addition of 6 grms. of ammonium chloride to prevent precipitation, 30–40 mgrms. of gold can be deposited at 60° C., with a voltage of less than 0.6 volt for the first 30–45 minutes and below 1.3 volts for the remainder of the time, complete deposition usually requiring 1½ hours. Under the conditions stated, gold can be completely separated from equivalent amounts of copper and iron, but the time required for electrolysis is greater than

when these metals are not present. It makes very little difference whether the electrolysed solution is neutral or much more acid than stated above. The average time required for carrying out a complete determination of gold by this method is less than 2 hours.—J. F. S.

Fusibility of coal ash. Fieldner and others. See IIa.

Benzol in gas. St. Claire Deville. See IIa.

Pyridine and ammonia. Prideaux. See III.

Beating tests [for paper pulp]. Sutermeister. See V.

Soda and sulphite pulp in paper. Wasicky. See V.

Hydrochloric acid and ammonia. Auger. See VII.

Hydrocyanic acid and copper. Jennesseaux. See VII.

Analysis of barytes. Frenkel. See VII.

Boric oxide in glass. Cauwood and Wilson. See VIII.

Cast iron and steel. Marinot. See X.

Phosphorus and silicon in cast iron. Cavazzi. See X.

Lead in brass and alloys. Hodgson. See X.

Oil in oil-seeds. Blazzo. See XII.

Free carbon in rubber. Smith and Epstein. See XIV.

Acid in tan liquors. McCandlish and Lederer. See XV.

Organic phosphorus of soil. Schollenberger. See XVI.

Water analysis. Bado and others. See XIX.

Extract in tinctures, etc. Eschbaum. See XX.

Acetylsalicylic acid. Dahm. See XX.

PATENTS.

Transformation points; Method of and apparatus for determining —. R. P. Brown, Assignor to The Brown Instrument Co., Philadelphia, Pa. U.S. Pat. 1,285,920, 26.11.18. Appl., 14.11.17.

The substance to be tested and a neutral substance are subjected to the same heat conditions, by which their temperature is varied through a range which includes the transformation point. The varying temperatures of the two substances are used to maintain two differences of potential, one of which is a function of the temperature of the test substance, and the other a function of the temperature difference between the two substances. The movable element of an electric measuring instru-

ment is deflected by two forces alternately, one due to both differences of potential simultaneously, and the other due to the first difference of potential only.—W. F. F.

Carbon dioxide analyser. A. Butcher, Philadelphia, Pa. U.S. Pat. 1,285,927, 26.11.18. Appl., 22.3.17.

A CIRCULAR plug is provided with an internal pocket communicating with two ports on its periphery, and is arranged to turn in a casing provided with ports. In one position the pocket communicates by one port in the casing with the supply of gas to be examined, and by another port with the atmosphere, so that the pocket is filled with gas. On turning the plug, the pocket communicates by its two ports with a carbon dioxide absorbent contained in a cup carried by the casing, and with a closed indicator tube respectively, and by a further turn of the plug, the indicator tube is placed in communication with the air.—W. F. F.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

- Davies. Separation of gases. 4428. Feb. 22.
Du Pont de Nemours and Co. Recovering solvent. 4276. Feb. 20. (U.S., 19.1.18.)
Fadden. Apparatus for producing mineral distillates of definite composition. 3944. Feb. 18.
Fowler. Apparatus for subjecting air, gases, and vapour to the action of liquids. 3638. Feb. 14.
Gründal. Lixiviating granular or pulverulent material. 3464. Feb. 12.
Harberd and Sonsthagen. Atomising viscid material. 3364. Feb. 11.
Morison. Condensing plant. 3935. Feb. 17.
Schuck. Production of a catalyst. 3985. Feb. 18.
Shaw. Apparatus for evaporating or concentrating liquids. 3238. Feb. 10.
Smith. Crucibles and melting-pots. 3483. Feb. 13.
Soc. d'Etudes Chimiques. Fractional distillation of liquids. 3728. Feb. 15. (Switzerland, 20.2.18.)
Soder. Grinding-mills. 3582. Feb. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

- 1523 (1918). Stansfield. Treating smoke, furnace gases, exhaust gases, etc. (122,871.) Feb. 19.
2242 (1918). Huhn. Drying granular materials. (122,910.) Feb. 19.
2246 (1918). Fraser, and Fraser and Co. Machines for mixing triturated or granulated materials. (123,135.) Feb. 26.
2524 (1918). Pulsometer Engineering Co., and Bjornstad. Filters. (123,152.) Feb. 26.
2662 (1918). Perry. Apparatus for distilling. (122,925.) Feb. 19.
2765 (1918). Adams. Apparatus for lifting insoluble or semi-solid matter. (123,169.) Feb. 26.
5081 (1918). Francart. Tunnel kilns, ovens, etc. (122,957.) Feb. 19.
5107 (1918). Kestner. Evaporators. (122,958.) Feb. 19.
8482 (1918). Wilson. Filter-presses. (122,979.) Feb. 19.
10,474 (1918). Walker. Pulverising-mills. (123,259.) Feb. 26.

- 14,248 (1918). Stein et Cie. Tilting-furnaces. (120,200.) Feb. 19.
16,518 (1918). Aubert. *See X.*
17,520 (1918). Sands and Gourlay. Apparatus for separating immiscible liquids. (123,033.) Feb. 19.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Balfour and others. 3621. *See VII.*
Crank and Svensson. Gas generators. 3558. Feb. 11.
Davies. Carbonisation and gasification plant etc. 4339. Feb. 21.
Davies. 4428. *See I.*
Fadden. 3944. *See I.*
Fornas. Gas-producers. 3431. Feb. 12. (Fr., 13.2.18.)
Fornas. Gas-producers. 3503. Feb. 13.
Freeman. Gasifying solid and liquid fuels. 4154. Feb. 19.
Pearson and Son (Coxon). 4266. *See III.*
Pollock. Fuel. 4080. Feb. 19.
Serret. Treatment of fuels. 3417. Feb. 12. (Fr., 23.10.16.)
Smith. Gasifying coal and obtaining by-products therefrom. 3916. Feb. 17. (U.S., 16.2.18.)
Smith. Furnace retorts. 3918. Feb. 17. (U.S., 18.2.18.)
Townsend. Apparatus for heating water-gas in coal carbonisation. 3191. Feb. 10.
West and Wild. Gas-producers. 4010. Feb. 18.

COMPLETE SPECIFICATIONS ACCEPTED.

- 15,524 (1917). Marks (Ledoux). Kilns for carbonising and distilling wood. (123,111.) Feb. 26.
2521 (1918). Deakin (Roth and Venturino). Transforming heavy petroleum and products into lighter products. (123,151.) Feb. 26.
2851 (1918). Marks (Soc. Anon. Ital. Ansaldo and Co.). Refractory material used in surface-combustion processes. (123,175.) Feb. 26.
2924 (1918). Marks (Soc. Anon. Ital. Ansaldo and Co.). Simultaneously producing gas from lignite and other combustible materials, and slag for agricultural purposes. (123,177.) Feb. 26.
14,708 (1918). Stafford. Destructive distillation of wood. (119,040.) Feb. 19.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

- Pearson and Son (Coxon). Distillation of hydrocarbons. 4266. Feb. 20.
Selden Co., and Selden. Treatment of cymene. 4275. Feb. 20.
Sutton. Sulphonation. 4278. Feb. 20.

COMPLETE SPECIFICATION ACCEPTED.

- 2646 (1918). Blakeley. Still or preheaters for dehydrating tar etc. (123,163.) Feb. 26.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

- Baxter. Solution for rendering combustible materials fire-resisting. 3485. Feb. 13.
Frood. Treatment of organic and inorganic fibres and fibrous fabrics and materials. 3975. Feb. 18.
Murray. Manufacture of paper. 3963. Feb. 18.
Wilson. Apparatus for drying wool. 3439. Feb. 12.

COMPLETE SPECIFICATION ACCEPTED.

- 5732 (1918). Marx. Refining-engines for producing paper pulp. (122,964.) Feb. 19.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Morley. Machines for bleaching etc. textile fabrics and yarns in rope form. 4229. Feb. 20.
Soc. des Combustibles Industriels. Impregnating or coating material with insulating, dyeing, or other fluid product. 4369. Feb. 21. (Belg., 7.2.16.)

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Balfour, Bray, and British Oxygen Co. Manufacture of hydrogen. 3621. Feb. 14.
Dupont, and Darrasse Frères. Utilising marine algae for making formic, acetic, and butyric acids and for extracting salts of iodine and potash. 3508. Feb. 13. (Fr., 13.2.18.)
Fairbrother (Chemical Construction Co.). Production of potassium nitrate. 4255. Feb. 20.
Freeth and Munro. Removal of calcium and magnesium from rock-salt brine or solutions of rock-salt in water. 3754. Feb. 15.
Gros et Bouchardy. Production of nitrogen compounds containing hydrogen with aid of electric discharges. 4490. Feb. 22. (Switzerland, 25.2.18.)
Joseph. Ozone generators. 3538. Feb. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

2639 (1918). Turnbull and Morris. Chlorination of water, alkaline, or other solutions. (122,888.) Feb. 19.
2130 (1918). Gaillard. *See* XVI.
2253 (1918). Norton Co. *See* VIII.
4291 (1918). Morris. Manufacture of acetate of lead and other acetates. (122,953.) Feb. 19.
7841 (1918). Dutt and Dutt. Manufacture of aluminium chloride and aluminium-sodium chloride. (123,243.) Feb. 26.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Antoine. Compounds of glass. 3581. Feb. 13.
August. 3410. *See* X.
Hunter. Production of glass articles. 3564. Feb. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

16,229 (1917). Mottram. Manufacture of refractory goods. (123,116.) Feb. 26.
2253 (1918). Norton Co. Composition containing alumina and zirconia. (113,958.) Feb. 26.
2140 (1918). Peeters. Glass furnaces. (123,146.) Feb. 26.
2773 (1918). Marlow. Ovens or kilns for use in the manufacture of tiles, pottery, etc. (122,927.) Feb. 19.
2851 (1918). Marks (Soc. Anon. Ital. Ansaldo and Co.). *See* II.
5081 (1918). Francart. *See* I.
9727 (1918). Keith and Keith. Glass-annealing lehrs. (123,254.) Feb. 26.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Hoare. Production of building etc. material. 3470. Feb. 12.
Kernot. Adhesive or cementing compositions. 3897. Feb. 17.

COMPLETE SPECIFICATIONS ACCEPTED.

19,058 (1917). Evans and Andrews. Substitute for wood. (122,861.) Feb. 19.

18,379 (1918). Coates, Lupton, and Auderton. Cement. (123,037.) Feb. 19.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Aspinall, Denholm, and Schwartz. Separation of very finely divided ore from gangue. 4182. Feb. 20.
August. Furnaces for hardening or tempering steel tools or for heating or annealing metals, glass, pottery, etc. 3410. Feb. 12.
Barkes, Besford, and Day. Solder for aluminium etc. 3366. Feb. 11.
Bingham, and Huntington, Heberlein and Co. Rotary furnaces for roasting ores. 4474. Feb. 22.
Coles. Production of spring or tempered copper. 3857. Feb. 17.
Coles. Converting blue-billy into high-grade iron. 3858. Feb. 17.
Dunlop Rubber Co., and Twiss. Pickling or cleansing iron and steel articles. 3787. Feb. 15.
Hutchins. Apparatus for manufacture of sodium. 3595 and 4126. Feb. 13 and 19.
Hutchins. Manufacture of sodium. 4125. Feb. 19.
Jensen. Preservation of metals and metallic articles. 4161. Feb. 19.
Mackay. Drying blast-furnace air. 3915. Feb. 17.
Mathy. Rocking crucible furnaces. 4482. Feb. 22.
Smith. 3483. *See* I.
Stock. Manufacture of grey iron. 4082. Feb. 19.
Walker. Separation of metals. 3962. Feb. 18.

COMPLETE SPECIFICATIONS ACCEPTED.

4315 (1917). Turner. Manufacture of steel. (123,102.) Feb. 26.
4531 (1917). Turner and Blackwell. Manufacture of metal alloys. (123,103.) Feb. 26.
8782 (1917). Turner. Manufacture of rustless or stainless and like steel. (123,104.) Feb. 26.
8813 (1917). Turner. Manufacture of ferro-chromium. (123,105.) Feb. 26.
15,858 (1917). Turner. Manufacture of steel or ferro-alloys. (123,113.) Feb. 26.
369 (1918). Rand and Vanth. Aluminium alloy. (122,870.) Feb. 19.
12,781 (1918). Hulst. Treatment of lead bullion. (123,272.) Feb. 26.
14,621 (1918). Giton. Furnace for re-fusing and refining metal. (123,283.) Feb. 26.
16,518 (1918). Aubert. Regenerative tipping-furnaces. (120,559.) Feb. 26.
18,621 (1918). Davis and Twigg. Crucible furnaces. (123,039.) Feb. 19.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Clarke, and London Battery Co. Electric batteries. 4386 and 4387. Feb. 21.
Coles. Manufacture of zinc cylinders for primary batteries. 3800. Feb. 17.
Etchells, Greaves, Travis, and Watson and Co. Electric furnaces. 4320. Feb. 21.
Gerber. Devices for carrying out chemical processes by electrolysis. 4268. Feb. 20.
Gros et Bouchardy. 4490. *See* VII.
Harris. Electrolytic cell. 4382. Feb. 21.
Hutchins. 3595, 4126, and 4126. *See* X.
Joseph. 3568. *See* VII.
Moore. Electric arc furnaces. 3555. Feb. 13.
Moore. Electric furnaces. 3693. Feb. 14.
Soc. des Combustibles Industriels. 4369. *See* VI.

COMPLETE SPECIFICATIONS ACCEPTED.

14,991 (1917). Joel. Electric accumulators. (123,110.) Feb. 26.

14,372 (1918). Kayser and Macdonald. Improving the conductivity at the joints of electrodes for electric furnaces. (123,017.) Feb. 19.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Calvert. Treatment of oils, fats, etc. 4366. Feb. 21.

Fellowes and Hyatt. 4271. *See* XIII.

COMPLETE SPECIFICATIONS ACCEPTED.

19,323 (1917). Davidson. Machines for forming oil-cakes. (122,864.) Feb. 19.

6760 (1918). Martin and others. *See* XIX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Fellowes and Hyatt. Treatment of vegetable gums, resins, oils, and turpentine. 4271. Feb. 20.

Knecht. Production of nitrogenous compounds from resin. 3659. Feb. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

2377 (1918). Suzukawa. Paint for coating the bottoms of vessels. (113,612.) Feb. 19.

3394 (1918). Murray. Manufacture of water paint. (122,940.) Feb. 19.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

Peachey. Process for accelerating vulcanisation of caoutchouc etc. 4330. Feb. 21.

Smith (Claessen). Utilising bark shavings from rubber trees and extracting rubber from such shavings. 4242. Feb. 20.

COMPLETE SPECIFICATION ACCEPTED.

16,063 (1917). Gregory. Composition having the general properties of rubber. (123,114.) Feb. 26.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATION.

Neil and Smith. Leather solution. 3488. Feb. 13.

COMPLETE SPECIFICATION ACCEPTED.

1975 (1917). Goldreich, and Stern and Co. Substitutes for leather etc. (123,101.) Feb. 26.

XVI.—SOILS; FERTILISERS.

COMPLETE SPECIFICATIONS ACCEPTED.

2130 (1918). Gaillard. Process for enriching phosphates. (122,897.) Feb. 19.

2167 (1918). England. Chemical product for use as a fertiliser. (122,902.) Feb. 19.

2924 (1918). Marks. (Soc. Anon. Ital. Ansaldo and Co.). *See* II.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Candy. Purification of water. 3955. Feb. 18.

Darrasse Frères, and Dupont. Utilising hydrocarbon matter in plants, vegetable offal, etc. 3509. Feb. 13. (Fr., 13,218.)

Linden. Reducing percentage of water in sewage sludge etc. 3245. Feb. 10.

Savy. Drying vegetables, fruit, etc. 4043. Feb. 18. (Fr., 8,318.)

Savy. Manufacture of chocolate. 4208. Feb. 20. (Fr., 16,918.)

Yeomans. Process of drying and preserving vegetables. 3383. Feb. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1943 (1918). Peyton and Ferguson. Food preparations. (122,882.) Feb. 19.

2059 (1918). Turnbull and Morris. *See* VII.

2316 (1918). Straus. Non-alcoholic beverage, and process of making same. (113,611.) Feb. 19.

4197 (1918). Talbot. Apparatus for purifying and softening water. (123,198.) Feb. 26.

6760 (1918). Martin, and Co-operative Wholesale Society. Preparation of cocoa-butter for cooking and like purposes. (123,231.) Feb. 26.

12,779 (1918). Peyton and Ferguson. Food preparations. (123,271.) Feb. 26.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Acieries et Forges de Firminy. Catalytic treatment of acetylene for synthetic manufacture of acetaldehyde, paraldehyde, and acetic acid. 4017. Feb. 18. (Fr., 13,318.)

Acieries et Forges de Firminy. Manufacture of acetic acid and ethyl acetate from acetaldehyde or the primary material. 4018. Feb. 18. (Fr., 13,318.)

Acieries et Forges de Firminy. Manufacture of acetone and carbonic acid. 4019. Feb. 18. (Fr., 16,111.)

Applebaum. Manufacture of aldehydes. 4163. Feb. 19.

Crosfield and Sons, and Hilditch. Manufacture of acetaldehyde. 3541 and 3542. Feb. 13.

Darrasse Frères, and Dupont. 3508. *See* VII.

King and Wellcome. Isolation of a physiologically active compound. 3305. Feb. 11.

Mouneyrat. Process of bonding arsenic to organic molecules. 4245. Feb. 20.

Radcliffe. Preparation of allyl alcohol. 3497. Feb. 13.

Selden Co., and Selden, 4275. *See* III.

Thomson. Preparation of detoxicated vaccine. 3695. Feb. 14.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATIONS.

Saunders and Wellesley. Production of photographic films in natural colours. 4053. Feb. 19.

Smith. Photographic plates and films. 4390. Feb. 21.

XXII.—EXPLOSIVES; MATCHES.

COMPLETE SPECIFICATION ACCEPTED.

14,461 (1918). James. Matches. (123,018.) Feb. 19.

XXIII.—ANALYSIS.

COMPLETE SPECIFICATION ACCEPTED.

2827 (1918). Roberts. Apparatus for automatically taking samples of liquids. (123,173.) Feb. 26.

L—GENERAL; PLANT; MACHINERY.

Electrical precipitators. E. E. Thum. Chem. and Met. Eng., 1919, 20, 59—64.

THE author reviews the practical details which require attention in equipping a Cottrell electrical precipitator, and the conditions which require investigation and adjustment, to obtain efficient operation. In large plants it is advantageous to divide the treater into sections, each equipped with a complete set of motors, transformers, rectifiers, voltage regulators, etc., so that it can be worked and controlled independently. If the treater sections are all supplied with energy from a commercial current supply, outside loads may detrimentally alter the wave form. The electrical properties of the precipitated material should be determined, as a thin film of non-conducting material may lower the resistance of the gap between clean discharging and collecting electrodes as much as 50%. In such cases the deposit should be made conductive by humidifying the gas, or by adding a conducting dust (e.g. carbon). The wave form of the rectified current is regulated by slight rotation of the rectifier brushes. The treater clearance is adjusted by throwing the brush holder to one limit of its travel, and moving it slowly to and fro until the best position is obtained. The electrical conditions in the treater are indicated by the appearance of the arcing, or by the reading of a milliammeter on the high tension line. It is of first importance that the alternating current and rectifier should synchronise. The negative current is distributed to wires, chains, or thin pipes, passing through the collecting tubes, stretched by springs or weights and accurately centered at both ends by lattice frames, supported on insulated beams. In treating fumes containing sulphuric acid, the insulators are rapidly attacked and punctured by the thin film of acid deposited on them, and their replacement is an important item in the maintenance charges. Mechanical rapping is employed to remove the precipitate from the treater. In order that the current may be interrupted whilst cleaning a unit without overloading the others, a spare treater unit should be provided. If this is not possible, the plates or tubes should be cleared at short intervals without interrupting the current or gas, cutting off the current only when rapping the charged electrodes at longer intervals. Means should be provided whereby if localised arcing occurs (this is indicated by a jumping ammeter needle and heavy flames at the rectifier) circuit breakers are opened, or a protective resistance is automatically introduced. The current of the gas or vapour through the treater is best maintained by suction fans placed beyond the treater. The rate of flow of the gas, length of pipe, and temperature of gas require careful regulation. Large temperature variations should be avoided on account of the consequent variation of the volume of the gas treated, and its velocity through the tube; a rise in temperature lowers the arcing voltage. Steel skeleton tubes, lined with "transite board" (an acid-proof asbestos board) are used for treating gases which deposit inflammable or explosive fume. Combustible material should be removed from the apparatus as rapidly as it is precipitated.—S. S. A.

System of drying. Petit. See XIXa.

Drying and concentrating. Marmier. See XIXa.

PATENTS.

Extraction of mineral, animal, and vegetable substances. W. Anderson, Helensburgh. Eng. Pat. 122,477, 24.1.18. (Appl. 1369/18.)

THE claim is for the combination of the centrifugal extractor described in Eng. Pat. 23,148 of 1910 (this J., 1911, 941) with a condenser, a gravity separator, and an evaporator.—W. H. C.

Concentrating, distilling and/or elevating liquids; Apparatus for —. J. A. Reavell, Beckenham, and The Kestner Evaporator and Engineering Co., Ltd., London. Eng. Pat. 122,500, 31.1.18. (Appl. 1822/18.)

To prevent waterlogging in the apparatus described in Eng. Pat. 24,024 of 1899 (this J., 1900, 1092), pockets are formed in the outer tube or jacket of each element. Any liquid which may be condensed collects in these pockets and is discharged into a common outlet duct.—W. H. C.

Evaporator. G. H. Benjamin, New York. U.S. Pat. 1,288,480, 24.12.18. Appl., 29.12.17.

THE casing of an evaporator is provided with a number of removable doors on which internal heating coils with their connecting supply and exhaust pipes are mounted. A main steam inlet pipe is permanently connected to the upper part of the casing and an exhaust pipe to the lower part, and means are also carried by the doors to make the necessary connections between the connecting pipes of the coils and the main supply and exhaust pipes.—W. F. F.

Solutions; Method of concentrating —. H. V. Welch, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,289,984, 31.12.18. Appl., 10.5.17.

A SOLUTION containing a number of volatile constituents is heated to vaporise these constituents, and the mixed vapours are cooled in stages, so that each constituent is condensed in the form of a cloud which is then precipitated.—W. F. F.

Crystals from solutions; Obtaining of —. T. W. S. Hutchins, Middlewich. Eng. Pat. 122,507, 6.2.18. (Appl. 2171/18.)

THE solution to be crystallised is filled into bucket-shaped vessels from a storage and automatic measuring apparatus. The buckets are then conveyed by an endless chain conveyor through a series of baths, being raised as they pass from bath to bath and lowered during their passage through the baths. In the first two baths the buckets dip into cooled brine and crystals are deposited. They then pass through a third bath where they are slightly heated to loosen the crystals and are next emptied by a tippler on to an inclined grid. The crystals are retained and removed and the mother liquor passes through into a trough below.—W. H. C.

Manipulations out of contact with the air; Chambers for effecting — or in any desired atmosphere. A. Mouneyrat, Paris. Eng. Pat. 122,515, 13.2.18. (Appl. 2594/18.)

A CHAMBER of rectangular section is provided with five openings. Long flexible rubber gloves are inserted into the chamber through four of these openings, the wrists of the gloves being turned back and secured to flanges round the openings.

The fifth opening is furnished with a long flexible rubber tube whereby any desired substance may be introduced into the chamber, being received therefrom into the hands of the operator enclosed in the gloves. Any desired gas is introduced into the chamber by means of a nest of perforated tubes. The presence of air in the chamber may be detected by means of a benzene or like lamp in conjunction with a sparking device; the sparks light the lamp if air is present.

—J. S. G. T.

Electrical separation of suspended particles from gaseous bodies; Apparatus for the —. Huntington, Heberlein and Co., Ltd., and H. C. Bingham, London. Eng. Pat. 122,534, 5.3.18. (Appl. 3842/18.)

GASES containing suspended particles are passed through vertical pipes, which serve as the receiving electrodes, and are suspended in groups of four placed close together and equidistant from a common centre, the groups being spaced a suitable distance apart. Each pipe is built up from four flanged longitudinal segments, with distance or steadying pieces engaged between the segment flanges, and secured thereto by means of bolts through the flanges.—B. N.

Condensers and coolers for steam and other fluids. A. W. Brown, London. Eng. Pat. 122,563, 22.4.18. (Appl. 6747/18.)

THE cooling fluid passes through a series of vertical Field tubes, transmission of heat from the outer to the inner tube of the Field tube being reduced by means of a heat insulator. The tubes are surrounded by the fluid to be cooled, this flowing through the annular space between each Field tube and a concentric pipe of slightly larger diameter. The whole is arranged within a shell provided with suitable inlets and outlets.—J. S. G. T.

Cooling and condensing tower; Combined atmospheric —. E. Burhorn, Hoboken, N.J. U.S. Pat. 1,287,630, 17.12.18. Appl., 15.3.17.

THE sides of the tower structure are open to the air, and cooling water supplied at the top descends over a series of spaced superposed platforms. The condensing pipes are arranged in tiers between the platforms, and are exposed to the air and to the cooling water.—W. F. F.

Acids and other liquids; Vessels for containing —. W. Hayhurst, Accrington. Eng. Pat. 122,661, 26.10.17. (Appl. 15,608/17.)

THE joints between the tiles with which the vessel is lined are sealed with a condensation product of an aldehyde with phenol or its homologues. When the jointing is complete the vessel is subjected to an increased temperature to harden the jointing material. The latter may be mixed with asbestos if desired.—W. H. C.

Hearth furnaces; Method of operating superposed —. O. F. S. Carlson, Ljungaverk, Sweden. Eng. Pat. 122,712, 7.2.18. (Appl. 2247/18.)

IN a superposed hearth furnace, in which the material is transferred from hearth to hearth by means of mechanically or manually operated implements, the implement operating on the lowest hearth of any group is first actuated and then subsequent implements upwards through the group. By this mode of operation the material remains on each shelf for a longer time than when, as is

usual, the implements are actuated in the reverse order, and hence fewer hearths are required to attain the desired heating effect.—J. S. G. T.

Kilns, furnaces, ovens and the like. H. Francart, London. Eng. Pat. 122,742, 21.3.18. (Appl. 5027/18.)

A KILN for the heat treatment of metals, annealing, firing pottery, etc., consists of two parts, the combustion chamber and the treatment chamber. Fuel is burnt in the lower part of the combustion chamber which is provided with a regenerator of chequer brickwork. The top and bottom of the combustion chamber are respectively in open communication with the top and bottom of the treatment chamber. In operation, circulation of gases is thus maintained throughout the chambers, hot gases passing upwards in the combustion chamber and downwards in the treatment chamber. Such circulation, combined with the effect of the chimney draught, causes the gases to pursue a helicoidal path in the treatment chamber.

—J. S. G. T.

Drying-kiln. E. E. Perkins, Chicago, Ill. U.S. Pat. 1,290,778, 7.1.19. Appl., 19.3.17.

THE outlet pipe for the exhaust air extends downwards through the roof into the drying chamber and is hinged so that its lower part may be swung into an inoperative position to reduce the effective length of the pipe.—W. H. C.

Kiln and similar structure. H. R. Straight, Adel, Iowa. U.S. Pat. 1,290,848, 7.1.19. Appl., 11.11.16.

A KILN or similar structure is provided with a composite wall consisting of an inner and an outer shell with a heat-insulating packing of loose resilient material between them, a reinforcement for the top of the inner shell, and a crown supported on the top of it.—A. B. S.

Heating or cooling liquid or semi-liquid materials on a revolving cylinder; Apparatus for —. J. W. Leitch, Huddersfield, and G. H. Warburton, Heckmondwike. Eng. Pat. 122,721, 14.2.18. (Appl. 2677/18.) Addition to 117,500, 17.11.17 (this J., 1918, 496 A).

IN the apparatus described in the chief patent, a bucket wheel discharge is substituted for the worm conveyor, the casing in which the bucket wheel revolves being in communication with a chamber of considerable volume, evacuated by means of an air pump. In this manner a bucket, after discharge of material, is rendered "more or less vacuum" before again receiving material.

—J. S. G. T.

Filtering process and apparatus; Continuous pressure —. J. A. McCaskell, Salt Lake City, Utah. U.S. Pat. 1,288,433, 17.12.18. Appl., 1.5.17.

THE solid and liquid constituents of a mixture are separated by a rotating filter, the mixture being subjected to continuous pressure. The separated solids are continuously removed from the periphery of the filter by a scraper, and discharged in a semi-dry condition while maintaining the pressure in the filter chamber.—W. F. F.

Filter. E. E. Chapin, Wyoming, N.J. U.S. Pat. 1,288,508, 24.12.18. Appl., 29.6.16.

TWO filtering elements are combined, one having an external filtering surface, and surrounding the other which has an internal filtering surface. The space between the two elements communicates with an outlet for the filtrate.—W. F. F.

Filter; Self-cleaning. — E. Gminder, Reutlingen. Ger. Pat. 305,843, 15.4.17.

A FILTER-DRUM rotating within a chamber containing the material to be filtered communicates with an outlet chamber by a pipe leading from its interior. Adjacent to the bottom of the outer surface of the drum is a trough communicating with a separate outlet. In consequence of the greater head of liquid in the main chamber as compared with that in the outlet chamber, solid matter is dislodged from the outer surface of the drum and falls into the trough.

Filter with a surrounding annular filtering bed. L. Honigmann, Aachen. Ger. Pat. 308,727, 12.6.17.

FILTRATION is effected under reduced pressure in a cylindrical vessel with double concentric walls, between which is a bell dipping into liquid in the annular space. The outer portion of the top of the bell is perforated and serves as support for the filtering medium. The bell is rotated and the material to be filtered is delivered on to it from a hopper, the filter cake being removed by a scraper. The air is exhausted through a tube opening into a central chamber formed by a cylindrical partition rising from the bottom to above the level of the liquid in the vessel.—C. A. M.

Steam-boiler economiser plant. D. S. Jacobus, Jersey City, Assignor to The Babcock and Wilcox Co., Bayonne, N.J. U.S. Pat. 1,289,182, 31.12.18. Appl., 8.12.14.

THE burnt gases from a boiler furnace pass downwards through a vertical flue and then through a horizontal flue. The vertical flue contains a part of the economiser comprising a series of tubes inclined upwards in the direction of the flow of water and connected to horizontal headers, and the horizontal flue contains several sets of vertical tubes. The first mentioned part of the economiser is maintained at high pressure and the second at low pressure, and the flow of water is in counter-current to the flow of hot gases. Means are provided for the escape of air or gas from the heated water between the low- and high-pressure sections. In a combination of a number of boilers, each boiler has its own high-pressure section of the economiser and the low-pressure section is common to all the boilers. Means may be provided to direct the hot gases either through or around the low-pressure section.—W. F. F.

Heat-exchanging apparatus. H. Zimmermann, Assignor to Schutte and Koerting Co., Philadelphia, Pa. U.S. Pat. 1,289,350, 31.12.18. Appl., 21.9.16.

A NUMBER of heat-interchanging tubes are mounted with their opposite ends in tube-plates, and the structure is inserted bodily into a casing so as to leave spaces between the tube-plates and the end walls of the casing. These spaces are divided transversely by partitions so as to compel the fluid to take a zigzag course through the tubes, and baffles are provided for the fluid in the space surrounding the tubes. These baffles are supported by a pair of supports which engage the inner walls of the casing when the tube structure is inserted.—W. F. F.

Air-purifier. R. P. Fairbanks, Pocatello, Idaho. U.S. Pat. 1,289,421, 31.12.18. Appl., 31.10.17.

A CASINO is divided by a vertical partition into two unequal compartments, and a horizontal rotating shaft passing through both compartments carries a drum in the larger compartment having a foraminous cylindrical surface and solid end walls,

one of which is journaled against the partition. This end wall and the partition are each provided with an aperture communicating with the smaller compartment, and both compartments contain water to above the level of the lower part of the drum. Air to be purified enters the larger compartment above the drum, passes through the wetted foraminous wall into the drum, and thence through the partition to the other compartment, from which it is discharged.—W. F. F.

Tube-mill, A. P. Hachtmann, Allentown, Pa., Assignor to Lehigh Pulverizer Mill Co., Cata-sauqua, Pa. U.S. Pat. 1,290,178, 7.1.19. Appl., 15.2.16.

A TUBE-MILL is constructed with a number of independent longitudinal grinding compartments spaced away from the axis. Each compartment is provided with a number of abrupt corners to promote grinding action and communicates with the outer portions of the inlet and outlet compartments common to all the grinding compartments.

—W. H. C.

Drying apparatus for liquids. M. Oschatz, Dresden. Ger. Pat. 305,411, 13.10.14.

THE apparatus is of the type in which a heated cylinder rotates while partly immersed in the liquid to be dried, which is contained in a trough. The liquid overflows at one long side of the trough in order to maintain a constant level and is fed to the trough at the opposite side, the flow of liquid from one side to the other of the trough being in the same direction as that in which the cylinder rotates. By this arrangement there is less tendency for partly dried material to be dislodged from the cylinder as it emerges from the liquid and the output of the apparatus is increased.

Heat accumulator. Dr. Praetorius und Co., Breslau. Ger. Pat. 308,171, 4.12.17.

IRON oxide is mixed with clay or fireclay, with the addition of organic substances, soaked with combustible matter, and briquetted. When placed in a hot furnace, the briquette takes fire, and the oxide is reduced partly to iron, and partly to the lower oxides by the action of the products of combustion, and owing to the removal of the combustible matter, the briquette finally possesses considerable porosity. Oxidation of the reduced iron by the oxygen of the air, with evolution of heat, immediately follows the reduction process, and a considerable saving of fuel is claimed for the process.—J. S. G. T.

Separating substances in suspension by washing; Method of — B. Schwerin, Frankfort, Germany. Reissue 14,583, 7.1.19, of U.S. Pat. 1,029,579, 11.6.12. Appl., 11.2.13.

SEE Fr. Pat. 429,310 of 1911; this J., 1911, 1299.

Recovering solvents. Eng. Pat. 122,685. See V.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal. A. Pictet. Ann. Chim., 1918 [ix], 10, 249—330.

A MORE detailed account of work already published (see this J., 1913, 1098; 1914, 70; 1915, 163, 604; 1916, 1145; 1917, 958).—W. G.

Acetylene; Product of the action of the silent electric discharge on —. H. P. Kaufmann. *Annalen*, 1918, 417, 34–59.

If the reaction vessel is kept cool the product of the action of the silent discharge on acetylene is a brown viscous liquid (C_2H_2)_n, but when it is allowed to get warm a solid and a liquid are obtained. The liquid is very unstable and readily changes into the solid. Both readily absorb oxygen and on oxidation with alkaline permanganate yield benzoic, isophthalic, and terephthalic acids. Since it forms an explosive silver derivative the liquid product appears to contain a CH group. (See also *J. Chem. Soc.*, Apr. 1919).—C. S.

Calorimeter efficiency. White. See XXIII.

PATENTS.

Coal washing and apparatus therefor. W. Russell, London. Eng. Pat. 122,454, 21.1.18. (Appl. 1170/18.)

FINE coal containing waste material, or the water from coal washeries, is agitated with water containing 1–5 lb. of a frothing agent per ton of dry material. The frothing agent may be crude coal tar oil, crude creosote, eucalyptus oil, or oleic acid. The coal is separated from the waste material and pyrites by flotation, for instance as described in Eng. Pats. 7803 of 1905, 2359 of 1909, and 21,857 of 1910 (this J., 1906, 184; 1910, 496; 1911, 1263) and the froth containing the coal is removed by a Dorr classifier as described in Eng. Pat. 28,500 of 1910 (this J., 1911, 544). The finer portions of the waste material are treated in a Dorr thickener as described in Eng. Pats. 29,383 of 1910, 13,606 of 1914, and 110,188 (this J., 1915, 947, and 1917, 1228), and the water which is thus separated, containing a small proportion of oil, is used over again.

—W. F. F.

Coal and the like; Apparatus and method for cleaning —. H. R. Conklin, Joplin, Mo. U.S. Pats. 1,290,515 and 1,290,516, 7.1.19. Appl., 27.12.17 and 5.8.18.

A SEPARATING tank for coal is provided with an inclined plate at each end above the liquid level, the plates converging downwards with a space between them. An endless conveyor passes over the upper surfaces of the two plates and along the liquid surface between them and over the inclined bottom of the tank. The coal is delivered on to one of the plates and the conveyor, and on reaching the space between the plates the impurities sink through the conveyor and liquid on to the submerged portion of the conveyor, and the coal floats and is transferred on to the other inclined plate and thence to the discharge. The separating liquid consists of a mixture of water and the "fines" which are separated by a flotation classifier from ground argillaceous material. The material is ground to a fineness which allows its suspension in water without agitation, and the pulp is free from colloidal ingredients. The refuse is discharged by the submerged portion of the conveyor from the other end of the tank. The coal and refuse are washed free from the separating medium by water decanted from the vessel containing the separated fines, and the washing water is returned to the flotation classifier. The liquid level in the tank is maintained by a device which permits overflow from below the liquid surface.—W. F. F.

Peat; Method and means for removing water from —. A. ten Bosch and N. J. Zoon, The Hague. U.S. Pat. 1,290,494, 7.1.19. Appl., 23.4.18.

PEAT pulp is fed to the top of a vertical tower of such a height that the pressure due to the column

is sufficient to force the pulp out at the bottom through a constricted discharge opening. Steam under pressure is forced into the column through a pipe passing through the side of the tower, and water expressed from the peat passes through a perforated portion of the wall, at a lower level, into an annular discharge chamber.—W. F. F.

Coke-oven. R. S. Moss, Chicago, and A. Roberts, Evanston, Ill. U.S. Pat. 1,289,870, 31.12.18. Appl., 7.1.14. Renewed 23.3.18.

A COKE-OVEN is heated by hot gases passing through vertical flues in the walls, while the air supply is preheated by passing it through other flues alternating with the gas flues. The oven is mounted on a structure having a central longitudinal spent-gas tunnel into which the lower ends of the gas flues discharge. The air supply is admitted to one arm of a horizontal U-shaped passage, the arms of which extend along either side of the spent-gas tunnel, and the hot air passes from the other arm of the passage into the lower ends of the vertical air flues in the retort walls.—W. F. F.

Furnace gases; Device for causing combustion of —. G. P. Brown, Lake Bluff, Ill., Assignor to Combustion Improvement Co., Chicago, Ill. U.S. Pat. 1,287,864, 17.12.18. Appl., 7.2.17.

A HOLLOW circular member is arranged in the combustion chamber at some distance from the fuel zone, and is provided with openings in its periphery through which air is injected into the combustion chamber for the combustion of the unburnt gases. Hollow radial ribs are formed on the hollow member, having small openings for the discharge of air, so as to maintain combustion of the gases close to the hollow member. The latter is thereby heated so as to preheat the air which passes through it.—W. F. F.

Furnaces; Gas burner for —. H. C. Smart, Brooklyn, N.Y., Assignor to Standard Oil Co. of New York, New York. U.S. Pat. 1,288,450, 17.12.18. Appl., 11.4.18.

AN air-supply pipe embedded longitudinally in the wall of a still setting is provided with short transverse burner tubes extending to the inner surface of the wall. An inner concentric gas-supply pipe is provided with transverse jets extending into but shorter than the burner tubes. Adjustable supports are provided within the air-supply pipe and between its ends, to maintain the gas-supply pipe in its concentric position.—W. F. F.

Gas manufacture; Method of —. W. D. Wilcox, Chicago, Ill. U.S. Pat. 1,289,336, 31.12.18. Appl., 23.7.15.

COAL containing excess of moisture is continuously distilled in a series of vertical retorts heated externally. The gaseous products of low temperature distillation in the upper part of the retort are withdrawn through an outlet in that part, and the products of high temperature distillation are similarly withdrawn at the bottom. The solid residue from each retort passes into a generator below, through which air and the gaseous products of low temperature distillation are passed alternately. The gas produced whilst air is passing through the generator is burnt in a common heating chamber which supplies the heating flues of the retorts. The gas produced by the passage of the gaseous products of low temperature distillation through the generators and the lower part of each retort is withdrawn and stored.—W. F. F.

[Petroleum] spirit; Device for separating or trapping water contained in — immiscible with it, or in clean or refined oil. W. G. Tench, Southampton. Eng. Pat. 122,794, 13.8.18. (Appl. 13,116/18.)

A CYLINDRICAL vessel contains two very fine wire gauze strainers. The upper strainer is of hollow double conical form with a mid-peripheral ring which is attached to the wall of the separating vessel. The lower strainer forms an inverted cone, the top of which is closed by a sheet of gauze while the apex end is open and communicates through a valve with a spherical glass "trap" vessel beneath. The mixed spirit and water is fed into the lower strainer, when the water sinks and runs into the glass trap, while the spirit passes through the gauze into the upper part of the vessel, then through the upper strainer to an exit pipe. A cock at the bottom of the trap allows of water being run off as fast as it enters so that a constant level of water is maintained in the trap. An external pipe connects the upper part of the trap with the part of the vessel intermediate between the two strainers, and serves for the recovery of any spirit which has passed into the trap.—T. St.

[Petroleum] oil; Process of and apparatus for treating —. F. M. Seibert and J. D. Brady, Houston, Tex., Assignors to Gulf Production Co., Beaumont, Tex. U.S. Pat. 1,290,369, 7.1.19. Appl., 11.1.18.

PETROLEUM emulsions are passed between a pair of concentric tubular electrodes which are connected to a source of direct current giving a potential difference of 250 to 600 volts. The inner electrode is shorter than the outer and the two are spaced sufficiently far apart to prevent the passage of any substantial current. Oil is removed at the top of the inner electrode and water at the base of the outer.—T. St.

Hydrocarbons; Continuous treatment of — with liquid sulphur dioxide. Allgem. Ges. für Chem. Ind. m.b.H., Berlin. Ger. Pat. 297,131, 28.4.15.

The hydrocarbon to be purified (petroleum, paraffin, etc.) is passed upwards and the liquid sulphur dioxide downwards through the treatment chamber. The liquid sulphur dioxide is preferably introduced drop by drop and its flow through the treatment chamber and also that of the hydrocarbon are regulated by pumps so that adequate opportunity is afforded for the sulphur dioxide to dissolve hydrocarbons soluble therein.

Distillation of petroleum, tar, etc.; Vertical preheaters for use in the —. L. Steinschneider, Brünn-Königsfeld. Ger. Pat. 308,768, 14.10.17.

A VERTICAL vessel for preheating petroleum, tar, etc., before distillation is fitted with a heating system below the level of the liquid therein, but above the level of the layer containing water. Below the heating system, through which the hot vapours from the still are passed, is a partition provided with a flap which can be closed, or opened to any desired extent, so that the liquid surrounding the heating system may be separated either wholly or partly from the remainder of the liquid in the preheater. Below the partition is a second heating system through which the hot still residues are passed.—L. A. C.

Briquettes and method of making the same. C. H. Smith, Short Hills, N.J., U.S.A. Eng. Pat. 120,585, 29.8.17. (Appl. 17,693/18.) Int. Conv., 15.11.16.

See U.S. Pat. 1,276,429 of 1918; this J., 1918, 646 A.

Producer-gas tar. Ger. Pat. 305,861. See III.

Hydrogen. Eng. Pat. 122,474. See VII.

Removing carbon monoxide. Eng. Pat. 122,781. See VII.

Calorimeters. U.S. Pat. 1,289,918. See XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Welsbach mantle; A physical study of the —. H. E. Ives, E. F. Kingsbury, and E. Karrer. J. Franklin Inst., 1918, 186, 401—438, 585—625.

THE authors have investigated the spectral distribution of the luminous radiation from incandescent mantles containing mixtures of thorium with the oxides of the following metals:—cerium, uranium, manganese, nickel, lanthanum, praseodymium, neodymium, erbium. A detailed study is made of the conditions determining the behaviour of the absorption bands to which the enhanced visible radiation of the more efficient mantles is due. The characteristic features of the luminous radiation found in the case of the thorium-ceria mixtures are also exhibited by the various other mixtures, but in very different degrees. In all cases there is a mixture yielding a maximum luminous radiation. The value of this maximum is greatest with the mixture containing 0.75% of ceria, the radiant efficiency in this case being three times that of a black body at the same temperature. Mixtures of thorium with the oxides of uranium and neodymium likewise exhibit a radiant efficiency in the Bunsen flame notably exceeding that of a black body. The high efficiency of both the cerium and uranium oxides is due to a strong absorption band in the blue end of their spectra, this absorption band in the case of ceria being present only when the oxide is hot. The radiant luminous efficiency of a black body at 2100° abs. (1827° C.) is 0.5%. The radiant efficiency of a thorium-ceria mantle was increased threefold by raising the mantle temperature from 1900° to 2100°, the flame being fed with oxygen. The melting point of thorium is 2440° C. and of ceria 1950° C. Practical and theoretical considerations show that if ceria in the thorium-ceria mixture were replaced by a suitable colorant then a threefold increase of radiant luminous efficiency should be attainable with the flame temperature at present available. Such a colorant would differ from ceria in two respects; it would add nothing to the radiation in the long wave region near 2μ, and the absorption band responsible for the visible emission would be sharply defined on the red side. Convection losses largely neutralise any increase of radiant efficiency that may be theoretically possible with higher flame temperature, in the case when the flame is supplied with air, the energy loss due to convection being about 75% at 1900° abs. (1627° C.). The maximum possible efficiency attainable by heating a mantle in the customary manner is 2.6%. The efficiency at present realised with incandescence mantles is 0.19%, and in the case of the nitrogen-filled tungsten lamp the percentage efficiency is 3.2. The efficiencies referred to the coal used as the original source of energy, in the case of lighting by incandescent mantles and by the nitrogen-filled lamp are not greatly different. When subjected to cathode discharge, a thorium-ceria mixture shows no superiority of radiant efficiency over pure ceria. This phenomenon is ascribed to the reducing action of the discharge, the result being that no

colour is imparted to the mantle by ceria under these conditions. The far greater radiant efficiency of thorium in the discharge compared with ceria is ascribed to the large reduction of the convection losses in the vacuum tube.—J. S. G. T.

Oil of turpentine and rosin. Besemfelder. See XIII.

PATENTS.

Charcoal; Manufacture of vegetable —. G. Penrose, London, and J. D. Penrose, Watford. Eng. Pat. 122,465, 22.1.18. (Appl. 1276/18.)

PINE and like needles are mixed with 1–5% of lime or soda-lime or a larger equivalent of calcium carbonate. The mixture is carbonised with a limited amount of air at a temperature of 1000°–1200° C. The charcoal is freed from lime by washing with water containing 1–5% of hydrochloric acid, and is finally washed with water, with or without 1% of alkali.—W. F. F.

Carbon from peat; Means and method of obtaining — for decolorising purposes. J. W. Leadbeater, Doncaster. Eng. Pat. 122,698. (Appls. 1779, 31.1.18, and 7415, 3.5.18.)

PEAT is dried, ground, and mixed with ground quicklime. The dry mixture is placed in trays arranged in one or more rows, or in tiers of one or more rows, in a horizontal retort, with spaces between them, so that the hot gases may circulate round them. The retort is provided with a removable door at each end. The trays may be wholly or partly open at the top, and may be provided with hinged covers or slides for regulating the openings. They are also provided with suitable projections, or mounted on rollers, to permit the hot gases to pass round them. The resulting charcoal in granular form is washed with water, treated with hydrochloric or other acid to remove impurities, and then returned to the trays to be heated and dried.—W. F. F.

Carbon; Process of manufacturing decolorising — [from kelp]. F. W. Zerban, New Orleans, La., Assignor to the Government and people of the United States. U.S. Pat. 1,290,002, 31.12.18. Appl., 30.8.18. (Dedicated to the public.)

KELP is dried and carbonised, and the carbon then heated to a high temperature and cooled. The potash is removed from the material by washing with water, and the residue is treated with an acid and finally washed with water.—W. F. F.

Coal and other bituminous substances; Apparatus for the low temperature distillation of —. H. K. Hiller, London. Eng. Pat. 122,496, 30.1.18. (Appl. 1746/18.)

COAL, cannel, lignite, shale, colliery waste, bastard cannel, or other bituminous substance is distilled at a low temperature in a shallow, horizontal, rectangular retort heated externally by hot gases passing through longitudinal passages below the floor. The distillation gases pass through inclined louvres in the roof of the retort into a discharge flue above, extending the whole length of the retort and parallel to it. The louvres occupy about one-third of the area of the retort roof, and are inclined at 30° to the horizontal. Dust and air are excluded from the louvres during charging by placing a steel plate of the same width as the retort and longer than the stroke of the charging ram over the coal of the previous charge. The burner flues are wholly or partly filled with carborundum to prevent explosion and ensure surface combustion

of the combustible gases, which are admitted below the discharge end of the retort. The coal is charged into the other cooler end of the retort, and the distillation gases are swept out of the discharge flues above the retort by high-pressure gas admitted above the discharge end of the retort.

—W. F. F.

Coal and like carbonaceous materials; Destructive distillation of —. J. West, Southport, and S. Glover, St. Helens. Eng. Pat. 122,700, 31.1.18. (Appl. 1815/18.)

CANNEL coal and like bituminous materials are continuously distilled in vertical retorts arranged as described in Eng. Pats. 2663 of 1907 and 7757 of 1914 (this J., 1915, 482) and heated by surrounding superposed combustion chambers. The upper portion is heated to about 700° C., and the lower portion to about 1400° C., and superheated steam is passed into the lower portion of the retort. The steam may be superheated by hot waste gas as described in Eng. Pat. 120,458 (this J., 1919, 4A). A high yield of blue water-gas is produced in the high-temperature zone and passes through the low-temperature zone, serving as a carrier for, and mixing with, the distillation products.—W. F. F.

Photometer. U.S. Pat. 1,238,067. See XXIII.

III.—TAR AND TAR PRODUCTS.

Action of silent electric discharge on acetylene. Kaufmann. See IIA.

PATENTS.

Producer-gas tar or its crude distillates; Purification of —. Allgem. Ges. für Chem. Ind. m.b.H., Berlin. Ger. Pat. 305,861, 21.12.16.

PRODUCER-GAS tar or low-temperature tar contains considerable quantities of oxygen compounds. These may be removed, together with unsaturated hydrocarbons, by treatment with liquid sulphur dioxide (see Ger. Pats. 216,459 and 297,131; this J., 1910, 144, and page 167A), in which they are almost completely soluble.

Pyridine; Dehydration of —. C. R. Downs, Cliffside, N.J., Assignor to The Barrett Co. U.S. Pat. 1,290,124, 7.1.19. Appl., 24.4.18.

PYRIDINE bases are dehydrated by adding benzol and distilling the mixture.—L. A. C.

Treating hydrocarbons with liquid sulphur dioxide. Ger. Pat. 297,131. See IIA.

Distillation of tar etc. Ger. Pat. 308,768. See IIA.

IV.—COLOURING MATTERS AND DYES.

Amino flavones, flavone-azo- β -naphthol dyes, and other flavone derivatives; Synthesis of —. M. T. Bogert and J. K. Marcus. J. Amer. Chem. Soc., 1919, 41, 83–107.

FLAVONE (benz-2-phenyl- γ -pyrone) is of interest as the parent substance of several yellow vegetable colouring matters, notably those of quercitron bark and old fustic. The authors prepared it by a modification of Ruhemann's method (Chem. Soc. Trans., 1903, 83, 1154), by treating β -phenoxycinnamoyl chloride with anhydrous aluminium chloride. Flavone was nitrated in glacial acetic acid solution in

the presence of sulphuric acid by slowly adding nitric acid, sp. gr. 1.5, dissolved in glacial acetic acid, the whole being kept cold. The mononitroflavone obtained was separated into mixtures of the 3'- and 4'- and the 2'- and 3'-isomerides. From these, by reduction with stannous chloride, the corresponding aminoflavones were prepared and subsequently isolated by taking advantage of their differing basicities and solubilities. The aminoflavones were diazotised, and in this way 2', 3', and 4'-hydroxyflavones were prepared. The diazonium salts of the aminoflavones, when coupled with β -naphthol, gave rise to orange to red azo dyestuffs, which could be developed on silk and wool impregnated with β -naphthol with satisfactory results; on cotton the dyeings always developed unevenly. On silk and wool the 2'- and 3'-compounds gave bright or dull shades of orange, the 4'-isomeride giving red shades; in all cases the shades were brighter on silk than on wool. The dyeings were very fast to light and alkalis but were dulled by dilute acetic acid.—J. F. B.

Dyes; The genus Coprosma as a source of —, B. C. Aston. N.Z. J. Sci. Tech., 1918, 1, 264–267, 346–351.

The author has examined the dyeing-capacity of the bark of a number of species of *Coprosma*, notably *C. grandifolia*, *C. lucida*, *C. Baueri*, *C. robusta*, *C. areolata*, and *C. fetidissima*. The mode of extraction of the dye varies considerably with the different varieties. *C. grandifolia* and *C. areolata* fall into a class apart, giving fast purplish or maroon shades on chrome mordants with wool and orange-scarlet (tangerine) to dark red shades with stannous mordants and tartar in the single-bath method. *C. Baueri* and *C. robusta* gave negative results in the dyeing tests. *C. lucida* gives good reddish-brown colours, fast to light and soap, on chrome and alumina mordants. *C. fetidissima* gives excellent brown and yellow colours, fast to soap on chrome and stannous mordants respectively, but the tints are not fast to light. The colour of the cortex and the colour reaction when treated with 10% sodium hydroxide solution of twenty species of *Coprosma* are recorded and attention is drawn to the very pronounced individuality which is displayed. The colours given by various species of *Coprosma* with various mordants (potassium bichromate; aluminium sulphate and potassium hydrogen tartrate; aluminium sulphate, potassium hydrogen tartrate and oxalic acid; stannous chloride and potassium hydrogen tartrate; iron pyrophosphate; ammonium molybdate and acid; sodium tungstate; uranium acetate) are tabulated together with their behaviour towards light and soap.—H. W.

Quinocyanins. Fischer. See XXI.

PATENT.

[Colour] lakes. Eng. Pat. 122,540. See XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Bast fibres; Retting of —, P. Kraus. Z. angew. Chem., 1919, 32, 25–27.

EXPERIMENTS, performed chiefly with nettle stems, showed that retting can be effected by steeping the stems in a 0.5–1.0% solution of sodium bicarbonate at 23°–38° C. for 3–5 days. Other bicarbonates, e.g., those of potassium, magnesium, and ammonium are similarly effective, sodium carbonate and magnesium hydroxide are less so, and sodium, potassium, and calcium hydroxides are non-effec-

tive. The action is inhibited by poisons and is regarded as undoubtedly a biological retting. It may also be induced in a moderately hard water (9° hardness) by the addition of a little urine. The action does not take place at the ordinary temperature, but it is not essential that the favourable temperature of about 35° C. be constantly maintained; the liquid may be allowed to cool down and the retting will start again on re-warming. Similarly satisfactory results can be obtained with the stems of lupins, flax, and hemp, but these generally require a day longer than nettles. Previous breaking of the stems appears to favour a quicker retting, but it is considered much more advantageous to steep the stems whole, as the woody portions can then be withdrawn intact, whereas with broken stems particles of wood become entangled among the fibres. The process is eminently adapted for small cultivators. The air-dry stems are steeped in 20 times their weight of water containing 0.5% of sodium bicarbonate or other effective substitute, and maintained for about 3 days, continuously or intermittently, at about 35° C., until a sample, when treated with hot water, shows that the fibres are completely liberated from the wood. The mass is then scalded with water at 80° C., the woody stems are separated by agitation, and the fibrous mass is washed on a sieve. This mass may be freed from adherent gummy residues by boiling with dilute alkali, or more simply, by kneading to a paste with wet clay etc., drying, wetting again, and again kneading, washing and drying. A light beating with a wooden mallet will soften the strands ready for spinning.—J. F. B.

Balloon fabrics; Determination of permeability of —, J. D. Edwards. U.S. Bureau of Standards, Technol. Paper No. 113. India Rubber J., 1918, 56, 753–757, 789–793, 821–825, 863–867.

Of the two possible methods for the determination of the permeability of balloon fabrics by hydrogen, viz., by measurement of the volume loss and by direct estimation of the amount of hydrogen which penetrates the fabric under definite conditions, the former gives results which approximate to 70% of those obtained with the latter; this is due to the simultaneous permeability of the fabric to hydrogen and air. The latter method is preferred and the proportion of hydrogen which diffused across the film into the air on the other side was determined by means of an interferometer (see Adams, this J., 1915, 638; Edwards, J. Amer. Chem. Soc., 1917, 39, 2382). It was found that various fabrics gave similar curves for the effect of temperature on the permeability and that for approximate comparisons the permeability at 15° C. may be taken as 65% of that at 25° C.; alteration in pressure has but little influence on the permeability, the effect, however, being rather more marked at pressures below 60 mm. of water than between 60 and 110 mm.; humidity of the gas also does not greatly affect the permeability. As a result of some hundreds of tests it is shown that the fabric attains its maximum permeability in less than one hour, and generally in less than 30 minutes, but the period necessary for the complete sweeping out of the air from the apparatus may be longer and should be determined by trial. If the same piece of fabric is kept under continuous test for several days a gradual decrease in the permeability is generally observed and a similar effect may be produced by gently heating the fabric, e.g., to 70° C. Details of the method of carrying out the test are given.—D. F. T.

Paper tearing-resistance tester. H. N. Case. J. Ind. Eng. Chem., 1919, 11, 49–51.

TWELVE strips, 1 in. by 2½ in., are cut from the paper to be tested; these are then cut down the

centre from one end to within $\frac{1}{4}$ in. of the other end, and this end is cut off so that the silt stops $\frac{1}{4}$ in. from the end. One-half of the strips should have the long dimension parallel with the grain and the other half should be cut across the grain. One side of the cut-open end of a strip is then fastened in a clamp and the other side is bent over and a vessel is attached to it; water is allowed to flow steadily into the vessel until the uncut portion of the strip tears through; the weight of water required to effect this, expressed in grms., is termed the tearing-resistance value of the paper. Papers which appear to be of approximately equal strength when examined by the Mullen "pop-tester" and the Schopper tensile machine, often show a great difference in tearing quality.—W. P. S.

Specific inductive capacity of impregnated paper.
Weber and McKay. See XI.

Cottonseed fibres. De Segundo. See XII.

Oil of turpentine and rosin. Besemfelder. See XIII.

[Cotton] bolly refuse. Dowell and Friedemann. See XIXa.

Selective coloration of lignified plant membranes.
Bugnon. See XXIII.

PATENTS.

Leather, yarn, textile and other materials; Machines for drying and conditioning —. A. N. Marr, Horsforth. Eng. Pat. 122,544, 18.3.18. (Appl. 472/18.)

THE machine comprises a single drying chamber closed at the end opposite the feeding end. Above and below the drying chamber, air conduits extend along the whole length of the machine and are in communication with the drying chamber by means of openings provided in the top and the floor of the chamber. At the closed end of the machine a closed compartment is situated containing a fan which draws air from the end of one of the conduits and delivers it into the end of the other. Radiators are arranged in the fan compartment for warming the air drawn in before it is discharged into the other conduit. The air may be circulated through the drying chamber in either an upward or a downward direction. Pipes or coils supplied with steam or freezing liquid for heating or cooling the air may be arranged in one or both of the conduits. The material to be dried or conditioned is carried through the chamber on poles engaged by two or more endless chains travelling on a number of longitudinal races.—J. F. B.

Recovery of solvents and volatile liquids — and apparatus therefor. J. Lloyd, Stockport, and J. H. Wild, Salford. Eng. Pat. 122,685, 26.1.18. (Appl. 1500/18.)

IN an apparatus for the recovery of the volatile solvents from solutions used in rubber spreading, proofing, cleaning, etc., of fabrics, the proofed fabric travels over a steam-heated table, over which a closely fitting hood is erected. Dried air is circulated over the fabric and together with the vaporised solvent is drawn by means of a fan into a duct arranged across the hood near the centre of the table. The air and vapour pass thence into a condenser where the solvent is recovered; the air passes on, and is heated by steam and purified before again circulating over the fabric. A by-pass is arranged so that when necessary a portion only

of the air is reheated and returned to the fabric, the remainder of the air being employed for cooling and condensing. By means of side covers the width of air space may be varied to suit different widths of fabrics.—J. S. G. T.

Fibrous material; Impregnated and coated sheet of — and process of producing the same. J. J. Byers, Brookline, Mass., Assignor to Products Syndicate, Inc., Boston, Mass. U.S. Pat. 1,290,073, 7.1.19. Appl., 18.4.17.

FIBROUS material, substantially free from moisture, is immersed in a bath containing a cellulose derivative, a non-oxidising oil, and a suitable solvent, the bath being heated and the material immersed for a sufficient time to cause the "cement" containing the oil to impregnate it throughout its mass. The impregnated material is subjected to pressure and heat before the "cement" has completely set. One or more surface films or coatings are applied in succession, these also being composed of a cellulose derivative in a suitable solvent. After the application of a finishing coat, the material is subjected to heat and pressure to impart the desired lustre.—J. F. B.

Yarn or thread; Sized —. E. W. Snyder, Los Angeles, Cal., Assignor to Ocotillo Products Co. U.S. Pat. 1,290,795, 7.1.19. Appl., 9.8.17.

YARN or thread is treated with a sizing composition containing ocotillo gum.—J. F. B.

Cellulose; Method for producing zinc chloride solution of —. W. Ogawa, S. Okubo, and I. Murata, Tokyo. Eng. Pat. 122,527, 21.2.18. (Appl. 3139/18.)

SOLID zinc chloride is added to a solution of zinc chloride which is saturated below 40° C. and the mixture is heated so that the solid salt dissolves completely above 40° C. The solution is heated further to nearly 100° C. and cellulose is then added, for example, 5% of the weight of the solution. The cellulose is rapidly dissolved, solution being complete within about half-an-hour; hot water may then be added if desired.—J. F. B.

Paper making [drying]. J. O. Ross, Assignor to B. F. Sturtevant Co., Boston, Mass. U.S. Pat. 1,290,360, 7.1.19. Appl., 11.12.13.

A soft, wet web of paper formed on the paper machine is supported during its passage over heated drying rolls and, as soon as the paper is sufficiently dry to support its own weight, it is removed from the rolls and the drying is completed by means of air blown against the surface of the paper, e.g. while carried in festoons.—J. F. B.

Adhesives or binders [from sulphite-cellulose waste liquor]; Manufacture of —. W. H. Dickerson, Muskegon, Mich. U.S. Pat. 1,290,118, 7.1.19. Appl., 10.1.13.

WASTE sulphite liquor is treated with a neutralising agent insoluble in water, for instance, calcium carbonate, insufficient in quantity to neutralise the whole of the acid, the neutralising agent being added during or before the concentration of the liquor under vacuum.—J. F. B.

Pyroxylin compositions; Solvents used in connection with — and pyroxylin compositions containing the same. E. C. R. Marks, London. From E. I. Du Pont de Nemours and Co., Wilmington, Del., U.S.A. Eng. Pat. 122,456, 21.1.18. (Appl. 1181/18.)

SEE U.S. Pat. 1,266,073 of 1918; this J., 1918, 461A.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Laundry goods [textiles]; Oxygen tendering of —.
B. Haas. Chem.-Zeit., 1919, 43, 49–51.

PREVIOUS investigations on the injurious action of laundry preparations containing peroxidised compounds (this J., 1918, 238A, 576A) have all been carried out on strips of fabric rendered uniformly dirty by artificial means. If the tests could have been organised under more natural conditions with unevenly dirty and worn garments, the results would have shown far more strikingly the unfavourable action of the oxidising reagents. The tendering action takes place unevenly because, in order to obtain the complete bleaching of certain dirty spots, it is necessary to over-treat the cleaner parts of the fabric. Exposure to artificial actinic light or to natural sunlight, particularly on the grass, induces an initial decomposition of the dirt, whereby the later application of peroxide detergents is enabled to complete the bleaching more easily, in more dilute solution, and with considerably less damage to the fabric. On the other hand the storage of the dirty goods for a considerable time in tightly enclosed bundles fixes the dirt more permanently and increases the difficulty and danger in removing it by peroxidised reagents. Moreover the nature of the dirt is such that acidity is either present or developed during steeping, so that rapid generation of active oxygen may be induced or metallic stains possibly with catalytic properties may appear. For this reason a preparatory alkaline treatment should not be omitted; in default of soda, mixtures of lime and ammonium salts may be used with advantage. The proper employment of an alkaline detergent may, in fact, render the subsequent application of oxygenated laundry agents, in highly dilute form, comparatively harmless.

—J. F. B.

Dyes from Coprosma species. Aston. See IV.

PATENTS.

Kier-bleaching. G. B. Flood, North Adams, Mass.
U.S. Pat. 1,290,156, 7.1.19. Appl., 17.5.18.

A BLEACHING kier is provided with two separate ducts below the grating, each having a check valve opening outwards and leading to a separate closed receptacle for the liquor, from the bottom of which a return pipe rises and discharges directly into the top of the kier. The two receptacles are also connected with a steam supply, the valves controlling the admission of steam to the receptacles being connected with mechanism whereby they are opened and closed alternately, so that the contents of one receptacle is being forced by steam pressure into the top of the kier, while the steam valve of the other is closed and liquor is draining into the receptacle from the bottom of the kier. These alternate operations take place in continuous succession, so that the circulation of the liquor is effected at a quantitative rate approximately commensurate with that of its drainage.—J. F. B.

Dyeing machine. H. M. Dudley, Philadelphia, Pa.,
U.S.A. Eng. Pat. 113,440, 5.2.18. (Appl. 2053/18.)
Int. Conv., 15.2.17.

See U.S. Pat. 1,261,498 of 1918; this J., 1918, 412A.

Dyeing machine. H. M. Dudley, Philadelphia, Pa.,
U.S.A. Eng. Pats. 114,421 and 114,621, 23.2.18.
(Appls. 3234 and 3233/18.) Int. Conv., 29.3 and 31.3.17.

See U.S. Pats. 1,259,839 and 1,259,840 of 1918; this J., 1918, 297A.

Dyeing yarns, threads, or similar materials; Machines for winding and —. W. A. Ainsworth and C. N. Mather, Grand Rapids, Mich., U.S.A.
Eng. Pat. 122,786, 12.7.18. (Appl. 11,427/18.)

See U.S. Pat. 1,274,972 of 1918; this J., 1918, 621A.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Sulphuric acid; Application of electric heating to the concentration of —. S. Pagliani. Annali Chim. Appl., 1918, 10, 134–137.

FOR the concentration of 100 kilos. of sulphuric acid from 50°–52° B. (sp. gr. 1.53–1.563) to 65° B. (sp. gr. 1.832) in platinum stills a minimum consumption of 18 kilos. of anthracite is required, the average amount being 20 kilos. For apparatus of the Kessler type the consumption is only 10 kilos., whilst modern platinum apparatus of the Desmoutis type requires 12 to 15 kilos. of fuel. Experiments in which the acid was concentrated in vessels containing platinum electrodes showed that on the average 43 kilowatt-hours was required to obtain 100 kilos. of acid at 65° B. (sp. gr. 1.832) from acid of 52° B. (sp. gr. 1.563). Taking 7500 cal. as the mean calorific power of anthracite the thermal efficiency, i.e., the ratio of the heat theoretically necessary for concentration of the acid to that actually consumed is 0.25 for lead pans, 0.34 for platinum stills, and 0.49 for apparatus of the Kessler type, as compared with 0.93 for concentration by electric heat. The yield by the electric method may be increased by using closed apparatus of quartz, cast iron, or lava, provided with a scrubber, as in Kessler's apparatus. In one series of experiments a yield of 40 kilos. of acid of 65° B. (sp. gr. 1.832) per hour was obtained. With regard to the relative costs of the processes, with coke at 60 lire (45s.) per ton, electric energy would be 1.4 centesimi per kilowatt, and the relative costs with electric energy and with anthracite would be in the ratio of 9 to 5.—C. A. M.

Sulphur in pyrites; Determination of —. H. C. Moore. J. Ind. Eng. Chem., 1919, 11, 45–49.

THE Allen and Bishop method (oxidation with bromine in carbon tetrachloride solution, followed by treatment with nitric acid, and precipitation of the sulphuric acid as barium sulphate after removal of silica and reduction of ferric salts; see this J., 1912, 919) is described in detail. The method is accurate, and yields very concordant results, as is shown by figures reported by thirty-three different analysts working independently on portions of the same sample of pyrites.—W. P. S.

Sulphide sulphur in pyrites; Rapid determination of —. A. Bartsch. Chem.-Zeit., 1919, 43, 33–34.

A RAPID method of determining sulphide sulphur in pyrites is based upon the fact that the whole of the sulphur in that form is liberated as hydrogen sulphide on treating the mineral with hydrobromic acid in presence of metallic mercury. The ordinary apparatus used for the determination of sulphur in iron and steel may be used. Sufficient mercury (about 20 c.c.) to cover the bottom of the evolution flask is introduced, and after the addition of 0.25 grm. of the finely powdered sample, the air is removed from the apparatus by means of a strong current of carbon dioxide. The pyrites is dissolved in 50 c.c. of hydrobromic acid (free from chlorine) which is forced into the flask by means of a current of carbon dioxide, the flask being meanwhile gently heated. The hydrogen

sulphide is absorbed in 600 c.c. of a solution of 25 grms. of cadmium acetate and 200 c.c. of acetic acid per litre, or of 20 grms. of zinc acetate, 5 grms. of cadmium acetate, and 200 c.c. of acetic acid per litre. After solution of the pyrites is complete, the liquid is boiled for a short time, and, after removal of the flame, a rapid current of carbon dioxide is passed through the apparatus for at least 15 mins. Fifty c.c. of standard iodine solution (197.88 grms. in 10 litres) is then added to the contents of the absorption flask, and, after the addition of 50 c.c. of hydrochloric acid (1:1), the excess of iodine is titrated with standard thiosulphate solution. Each c.c. of iodine solution corresponds to 1% of sulphide sulphur.—C. A. M.

Nitric oxide; Oxidation of — by dry air. A. Sanfourche. *Comptes rend.*, 1919, 168, 307–310. (See this J., 1919, 132A.)

The first stage in the oxidation of nitric oxide, $4\text{NO} + \text{O}_2 = 2\text{N}_2\text{O}_3$, is practically instantaneous and independent of the temperature between -50°C . and 525°C . The second stage $2\text{N}_2\text{O}_3 + \text{O}_2 \rightleftharpoons 4\text{NO}_2$, is reversible. Up to 200°C . it tends from left to right, but from 200° to 525°C . it tends more and more from right to left as the temperature rises.

—W. G.

Furnace settings for caustic pots. F. H. Nickle. *Chem. and Met. Eng.*, 1919, 20, 65–69.

In the most usual type of caustic pot setting, i.e. the radial Dutch oven type, the products of combustion from a Dutch oven built on the centre line of the pot, are delivered radially towards the pot, and dividing on the centre line, travel around the pot in opposite directions, to a common flue in the rear. A battery of two pots is frequently worked in conjunction with a third or back pot used as a preheater. Sometimes, for economy of space, the flue connection between the front and back pots is built on the line joining the centres of the pots, but this construction causes the gases to short circuit along the shorter flue on one side of the front pot, leaving the other side deficient in supply of heating gases. A V-shaped fire-guard, fixed just in front of the pot, to protect it from direct contact with the flames, necessitates widening of the flue entrance, with consequent weakening of the arch at its rear end. The Nickle tangential Dutch oven type of setting, consists of a battery of two pots, each heated by a Dutch oven, the gases from which strike the pot tangentially, and after travelling almost completely around the pot, discharge into a soot chamber. As a fireguard is unnecessary, the throat behind the bridge wall is unrestricted; a relatively low velocity of the heating gases is thus attained and this, combined with the tangential effect, eliminates local overheating. The velocity of the gases travelling round the pot is maintained by reducing the area of the heating passage as it advances round the circumference. The rate of heat absorption by the dry wall of a caustic pot is dependent on the length of the path along which the gas is in contact with the heating surface, and the "hydraulic mean depth," or the average mean distance of the gas from the heating surface. The average "hydraulic mean depth" of the radial type of setting is 2.00 and of the Nickle tangential type 0.75, the latter type thus giving 2.66 as many contacts of the gas with the heating surface in a given time. The tangential setting promotes horizontal circulation of the caustic liquor about the axis of the pot (see U.S. Pat. 1,191,338; this J., 1916, 915). The non-conducting steam bubbles generated at the surface of contact of the liquor with the pot, are removed by the friction of the liquor against the pot, and assist in further promoting the circulation. This manner of circulation causes suspended impurities to collect in the centre.

where they rapidly settle, saving time in settling, and reducing the amount of caustic bottoms in the finished product. To recover the waste heat from the gases without using a third pot, an auxiliary flue is provided, by means of which the furnaces may be operated in reversible series or in parallel. In another type of furnace, designed specially for firing with crude oil or gas, good combustion is obtained by passing the products of combustion through a series of radial ducts leading to the heating passage. Waste flue gases are used for heating the exterior of the fire-wall that surrounds the combustion chamber and the pot. This type of pot setting is used in the manufacture of carbon bisulphide as well as of caustic soda.—S. S. A.

Ammonia; Production of — from nitrolim [crude calcium cyanamide], and the time yield under various conditions. W. Grahmann. *Z. Elektrochem.*, 1918, 24, 385–391.

THE rate of production of ammonia from boiling solutions of nitrolim; nitrolim and sodium hydroxide or carbonate; and nitrolim and potassium hydroxide or carbonate, of various concentrations, has been determined. In the case of nitrolim and water the rate of decomposition of calcium cyanamide is extremely slow in all concentrations at the boiling point and atmospheric pressure. Thus in a 1% solution 98% is decomposed by 72 hours' boiling. In the presence of sodium carbonate the reaction measured is really the decomposition of sodium cyanamide at first under constant sodium hydroxide concentration and then (after the whole of the calcium of the cyanamide has been replaced by sodium) under a concentration of sodium hydroxide which increases during the reaction. In the case of an addition of sodium hydroxide the decomposition of the sodium cyanamide takes place under a regularly increasing concentration of the hydroxide. The same remarks apply to the decomposition in the presence of the potassium compounds. The presence of caustic alkali or alkali carbonate has an accelerating influence on the reaction; the velocity increases with increasing concentration of the added salt to a maximum after which it remains constant. The maximum in the case of alkali hydroxides occurs with much lower initial concentrations of alkali than in the case of alkali carbonates, for in these experiments the alkali concentration increases continuously from beginning to end of the decomposition. The experiments with potassium hydroxide and carbonate do not show the same maximum as the sodium compounds under similar conditions, so that since sodium hydroxide and potassium hydroxide are ionised to practically the same extent, it must be taken that the acceleration of the decomposition velocity is not dependent entirely on the hydroxyl ion concentration but that the cation and the non-ionised molecules also exert a specific action. A number of experiments were also carried out under 30 atmospheres pressure at 150°C . Under these conditions even without addition of alkali the decomposition occurs very rapidly until 75% of the calcium cyanamide is decomposed, after which the velocity becomes much less; thus in aqueous solution 75% is decomposed in 45 minutes but only 90% decomposed in 120 minutes; in the presence of 10% sodium hydroxide 75% decomposition is reached in 30 minutes and 90% in 75 minutes. The nitrolim used in the experiments contained 16.85% of cyanamide nitrogen, 0.65% of dicyandiamide nitrogen, 22.30% of free lime, and 0.31% of sulphur.—J. F. S.

Potash salts; Separation of —. H. P. Bassett. *Chem. and Met. Eng.*, 1919, 20, 76–77.

It was found to be almost impossible to separate the potassium salt efficiently from a three ion

system, such as sodium sulphate and potassium sulphate. Sodium chloride was therefore added, which produced a four ion system, and tended to cause separation of the salt with the common ion, *viz.*, sodium sulphate. In the presence of an alkali or a salt acting as an alkali, the "heavy acid" salts (*e.g.*, sulphates and chlorides) tend to be precipitated in the proportion in which they exist in solution, and in this case it is necessary to effect a preliminary separation of the "heavy acid" salts from the alkali, and treat them on the four ion principle. In a particular case, the solution to be treated contained 10.49% by weight of total solids, which on analysis gave 9.19% K_2SO_4 , 78.35% Na_2SO_4 , 0.56% $CaSO_4$, 11.90% $NaCl$. 20 grms. of common salt was added to 2000 c.c. of the solution, and on evaporation the salt precipitated (total 54 grms.) contained 99.29% Na_2SO_4 . By adding 14 grms. of common salt to the mother liquor, plus 1320 c.c. of stock solution, and evaporating, a second salt crop was obtained (total 98.50 grms.), containing 99.34% Na_2SO_4 . A third salt crop gave in this way 99.40% Na_2SO_4 , and a fourth crop showed on analysis 99.60% Na_2SO_4 , 2.08% $NaCl$, 8.32% K_2SO_4 . To the liquor from the fourth crop, 65 grms. of sodium nitrate was added, the liquor was evaporated, and a fifth crop obtained (total 39.20 grms.), containing 50.06% $NaCl$, 48.28% Na_2SO_4 , 1.23% $NaNO_3$. On cooling the mother liquor from this crop to the ordinary temperature, potassium nitrate crystallised out, which contained 92.96% KNO_3 , 0.50% $NaCl$, 0.39% Na_2SO_4 , 6.15% $NaNO_3$. Thus the first three crops gave a marketable quality of salt-cake, the fourth crop and the final mother liquor were returned to the evaporator, whilst the fifth crop contained the requisite sodium chloride.—S. S. A.

Lime; Determination of available calcium oxide in the different classes of — supplied to Rand reduction works. C. A. Melklejohn. J. Chem., Met., and Min. Soc. S. Africa, 1918, 19, 86—88.

In the determination of available calcium oxide in lime by extraction with sugar solution and subsequent titration, the whole sample of unslaked, lump lime should be passed through a disc pulveriser and the sample for analysis then ground in an agate mortar. With slaked and air-separated limes the top layer (about 1 inch) should be removed from the sample and rejected, the remainder being spread evenly on a sheet of paper and sampled with a spatula to obtain the portion for fine grinding. The lime and sugar solution should be agitated intermittently for 2—3 hours and allowed to settle overnight before titration, filtration being thus avoided.—W. E. F. P.

Phosphorites and superphosphates from the point of view of the sulphur industry. L. Tirelli. Chem. News, 1919, 118, 73—76.

In the extraction of sulphur from ores by partial combustion in sulphur-extraction furnaces, large quantities of sulphur dioxide, representing about one-quarter of the sulphur obtained, are lost. The author discusses in detail the possibility of success of processes devised for utilising this sulphur dioxide in place of sulphuric acid, in the production of superphosphate from phosphorites. By digesting 5 grms. of finely crushed and sifted phosphorite for 12 hours in 10 c.c. of a saturated solution of SO_2 (containing 300 c.c. SO_2 at 20° C.), evaporating the water in a closed vessel, and again mixing with 10 c.c. of SO_2 solution and digesting for 12 hours, Tennessee phosphorite gave 0.13 gm. of citrate-soluble phosphoric anhydride and Gafsa phosphorite 0.14 gm. 50 grms. of Tennessee phosphorite crushed, etc., as above, mixed with 50 c.c. of water, and subjected for 5 hours to the action of a cold moist

current of 100% SO_2 at a pressure of 1.5 atmospheres, gave 2.41% of citrate-soluble and 0.32% of water-soluble phosphoric anhydride. Two samples of porous Tennessee phosphorite, one of which was preliminarily treated with distilled water for 2 hours, and the other with a saturated solution of sodium nitrate for 2 hours, were exposed for 8 hours to a cold moist current of 100% SO_2 , and gave respectively, 1.25% and 1.02% of phosphoric anhydride soluble in water and citrate. Phosphorite powder exposed in thin layers to the long-continued action of SO_2 of various strengths, gave no better results. Very porous fragments of phosphorite, 1—5 cm. thick, treated for 10 days at 400°—500° C. in a current of gas containing 20% SO_2 , 9% oxygen (by volume), and traces of moisture, and then left in a damp atmosphere for some days, became covered with a light grey powder, the interior remaining apparently unchanged. The powder was found to contain 6.2% moisture (at 60°—70° C.), 8.9% P_2O_5 soluble in water, and 7.5% insoluble P_2O_5 , whilst the internal portion contained 0.1% P_2O_5 soluble in water, and 32.6% insoluble P_2O_5 . It is concluded that sulphur dioxide reacts only at the surface of particles of phosphorite, and that the process has no chance of success.—S. S. A.

Bucher cyanide process for the fixation of nitrogen. E. Posnjak and H. E. Merwin. J. Wash. Acad. Sci., 1919, 9, 28—30.

EXAMINATION of some samples of the crude technical products made by the Bucher process (this J., 1917, 451) showed the presence of weakly double refracting grains of about 0.03 mm. diameter. These had refractive indices $\alpha=1.527$, $\beta=1.532$, and $\gamma=1.537$, whereas sodium cyanide is essentially an isotropic substance. According to Bucher, sodium cyanide may be distilled from the mixture obtained by the Bucher process at 500° C., but these grains do not distil at 975° C. It is therefore concluded that the nitrogen-bearing constituent of the samples of the crude product examined consists principally of some substance other than sodium cyanide.

—J. F. S.

Chlorate and perchlorate in potassium nitrate [and ammonium nitrate]; Determination of —. A. Wogrinz and J. Kuber. Chem.-Zeit., 1919, 43, 21—22.

INVESTIGATION showed that the methods described by Winteler (this J., 1897, 358), Foerster (*ibid.*, 1898, 694), Hendrixson (*ibid.*, 1904, 951), and Tschernobajeff (*ibid.*, 1905, 561) are accurate when applied to potassium nitrate. For ammonium nitrate, Tschernobajeff's method gives results much too low and Winteler's method is unsuitable. Foerster's method, however, gives good results.

—W. P. S.

Calcium ferrite and aluminat; Mixed crystals of —. E. D. Campbell. J. Ind. Eng. Chem., 1919, 11, 116—120. (Compare this J., 1914, 964; 1915, 139; 1916, 1108.)

DICALCIUM ferrite, $2CaO.Fe_2O_3$, and monocalcium ferrite, $CaO.Fe_2O_3$, are shown to be the only definite compounds formed by lime and ferric oxide. Pure tricalcium aluminate, $3CaO.Al_2O_3$, has been obtained by crystallisation from a melt composed of a solution of lime in the compound, $5CaO.3Al_2O_3$. When a solution with the empirical formula, $8CaO.3R_2O_3$, in which the ratio $Fe_2O_3:Al_2O_3=1:3$, is slowly cooled, mixed crystals in which this ratio is 1:7 first crystallise out until the ratio in the residue reaches the value 3:5; mixed crystals in the latter ratio then crystallise out until at about 1370° C. the ratio in the residue reaches the value 1:1. (See also J. Chem. Soc., Apr., 1919.)—T. H. P.

Aluminium hydroxide; Disperse — J. V. Kohlschütter. *Z. anorg. Chem.*, 1919, 103, 1–25.

WHEN crystals of ammonium alum or aluminium sulphate are brought into contact with ammonia solution (1 to 10 N), they are rapidly and completely changed into more or less perfect pseudomorphs of aluminium hydroxide. The pseudocrystals can be dried (at 40°–110° C.) and even dehydrated, without losing the external form of the original crystals, although there is considerable shrinkage. The physical characteristics of the pseudomorphs, such as density and degree of dehydration at different temperatures, vary with the conditions of formation; thus strong ammonia solutions give denser and more perfect pseudomorphs than dilute ammonia, and alum gives denser products than aluminium sulphate. The pseudomorphs are true gels and after drying at 40°–110° C. are dissolved (peptised) by dilute acids forming colloidal solutions. The character of the sol obtained varies considerably with the method of preparation of the pseudomorph. The differences between the various products are ascribed to different degrees of dispersity in the gel. (See also *J. Chem. Soc.*, Apr., 1919.)—E. H. R.

Alkali aluminosilicates; Behaviour of — at high temperatures. H. Leitmeier. *Z. anorg. Chem.*, 1919, 103, 69–80.

WHEN the very pure variety of orthoclase, adular, m.p. 1145°+5° C. is kept for upwards of 500 hours at a temperature 10° below its melting point, it loses weight to the extent of 0.2%. The loss is attributed to volatilisation of alkali, but this cannot be confirmed by direct analysis owing to experimental limitations. The sodium aluminosilicate, labrador, shows a similar behaviour at 1235° C. (See also *J. Chem. Soc.*, Apr., 1919.)—E. H. R.

Basic exchange in silicates. II. E. Ramann and A. Spengel. *Z. anorg. Chem.*, 1919, 103, 81–96.

A STUDY of the action of salt solutions containing two basic ions on ammonium-permutite. When mixed potassium and calcium chloride solutions are used containing equivalent proportions of the two metallic ions, the ammonia is completely eliminated and the composition of the resulting permutite is independent of the total salt concentration in the solution used. In general, when mixed solutions are used, the ratio of the bases in the final permutite is not the same as their ratio in the solution, the permutite generally containing more of the base in which the solution is poorer. When calcium is present in solution in excess, together with sodium, potassium, or ammonium, the proportion of calcium in the final permutite is much smaller than in the solution. The same is true to a smaller extent of sodium in presence of potassium or ammonium. The alkali bases cannot be completely eliminated from permutites by prolonged treatment with calcium chloride. It is concluded that basic exchange in the case of such silicates as permutite is an ionic reaction following the general mass action law, but in the case of calcium and to a less extent sodium salts, a disturbing factor, probably of a physical character, comes into play.—E. H. R.

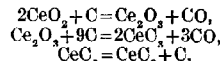
Silica; Precipitated amorphous — P. Braesco. *Comptes rend.*, 1919, 163, 343–345.

PRECIPITATED silica was mixed with 5% of sodium silicate as a paste, cast into sticks, dried and calcined. Its coefficient of dilatation was measured and compared with that of fused silica, on which a direct determination was made, and which was then powdered and treated as above. The results indicate that precipitated silica, dried and heated only

to 600° C., is in the amorphous form, but that if it is calcined at a temperature exceeding 1000° C., it is converted into crystalline cristobalite.—W. G.

Ceric oxide; Carburation of — A. Damiens. *Ann. Chim.*, 1918 [IX.], 10, 330–352. (See this *J.*, 1918, 723 A.)

THE formation of cerium carbide, CeC_2 , from the oxide in an electric furnace takes place in three stages:



The carbide CeC_2 is soluble in cerous oxide, and the intermediate products obtained in the carburation, one of which has been wrongly described by Sterba as an oxycarbide, $\text{CeC}_2 \cdot 2\text{CeO}_2$, are really solid solutions of this nature. The carbide, CeC_2 , is stable only between very narrow limits of temperature and outside these limits dissociates giving the carbide CeC_2 and graphitic carbon.—W. G.

Arsenic trichloride; Manufacture of — R. C. Smith. *J. Ind. Eng. Chem.*, 1919, 11, 109–110.

THE best method of making arsenic trichloride, on account of the simplicity of the process, the small amount of apparatus required, the short time necessary for the completion of the operation, and the high yields of almost pure product, consists in treating arsenious anhydride with sulphur monochloride: $2\text{As}_2\text{O}_3 + 6\text{S}_2\text{Cl}_2 = 4\text{AsCl}_3 + 3\text{SO}_2 + 9\text{S}$. The arsenious anhydride used should be as dry as possible. With proper control of the temperature (about 100°–125° C.) the reaction proceeds without difficulty. Based on the amount of sulphur chloride treated, the yield obtained on a small manufacturing scale was 93% of arsenic trichloride, having an average purity of 99%. Details are given of the manufacture and subsequent distillation of the product.—T. H. P.

Graphitic carbon. V. Kohlschütter. *Z. anorg. Chem.*, 1919, 103, 35–68.

A LENGTHY discussion of the properties of graphite, its mode of formation and probable structure. On account of the very variable properties of graphite and of the insensible gradations which can be obtained between graphite and amorphous carbon, the author concludes that all kinds of "black carbon" are merely physical varieties of one allotropic modification of diamond. Whether graphite or amorphous carbon is formed in any reaction producing free carbon depends upon the reaction conditions. The favourable condition for graphite formation is that the reaction should be localised, as for example in surface reactions such as the catalytic decomposition of acetylene or carbon monoxide, or in reactions where the carbon is formed *in situ* by the decomposition of a carbide, e.g., silicon carbide. Graphite is to be regarded as a special disperse form of carbon characterised by a dense lamellar structure. The author's view is confirmed by the results of the X-ray examination of graphite and amorphous carbon, which show that they are structurally identical. (See also *J. Chem. Soc.*, Apr., 1919.)—E. H. R.

Potash in cement-mill dust. Merz and Ross. See IX.

Ultramicroscopic examination of very thin deposits of salts. Hamburger. See X.

Fertilisers from ammonia. Bosch. See XVI.

Calcium phosphate and ammonium compounds from sewage. Gonné. See XIX.

PATENTS.

Hydrofluoric acid; Process and apparatus for the manufacture of —. E. Ridoni, and Soc. Talco e Grafiti Val Chisone, Turin, Italy. Eng. Pat. 115,425, 17.4.18. (Appl. 6525/18.) Int. Conv., 19.4.17.

A FURNACE is divided into a number of chambers, each of which contains a shallow muffle provided with a door in front and two openings on top. At the end nearest the door the bottom of the muffle is raised to form an edge which limits the quantity of the charge to a thin layer. Calcium fluoride is fed into the furnace through the door, and sulphuric acid through one of the openings on top. The hydrofluoric acid passes through the other opening to a horizontal pipe connected to each of the muffles and an outlet pipe conveys the acid to a condenser. A fan is also attached to the horizontal pipe whereby a strong suction can be created in the muffles when the reaction is complete, and by this means the residues are rapidly dried and assume a sandy character, facilitating their removal from the muffles. At the same time, the escape of acid vapours into the air is avoided when the muffles are opened.—L. A. C.

Titanium compounds; Production of —. Titan Co. A./S., Christiania. Eng. Pat. 115,020, 1.3.18. (Appl. 3624/18.) Int. Conv., 23.3.17.

FINELY powdered titaniferous iron-ore, e.g., ilmenite, is mixed with sufficient carbon (or other reducing agent) to reduce the iron and titanium oxides to metals, and the mixture is heated in an electric furnace in an atmosphere of nitrogen to about 1200°–1400° C. until reduction of the iron oxide is complete and the titanium is converted into a titanium nitrogen compound. The material is then crushed and lixiviated with dilute mineral acid to remove the iron. The dried residue is heated with concentrated sulphuric acid in the proportion of 2 pts. of 90% acid to 1 pt. of residue, yielding a product consisting of titanium sulphate, ammonium sulphate, and traces of ferrous sulphate. This is dissolved in 4 pts. of water, filtered, and the titanium precipitated as hydroxide by boiling the solution. Ammonium sulphate may be recovered from the solution by crystallisation, and the residual acid may be utilised for lixiviating the product from the furnace.—L. A. C.

Sulphuryl chloride; Manufacture of —. W. J. Pope, Cambridge. Eng. Pat. 122,516, 13.2.18. (Appl. 2611/18.)

A MIXTURE of dried chlorine and sulphur dioxide gases in approximately equimolecular proportions is brought in contact with charcoal, whereby the two gases combine with formation of sulphuryl chloride. The reaction proceeds more rapidly at or below the ordinary temperature than at higher temperatures, and as a large quantity of heat is evolved during the reaction, the vessel containing the charcoal is preferably cooled by cold water or ice.—L. A. C.

Nitrides; Production of —. A. R. Lindblad, Stockholm. Eng. Pat. 122,523, 20.2.18. (Appl. 3057/18.)

NITRIDES, e.g., silicon nitride, are prepared by heating the materials, e.g., a mixture of crushed quartz and carbon, in an electric furnace the electrodes of which enter the charge in places where it forms a "free spreading or sliding surface," nitrogen or nitrogenous gases being simultaneously introduced into the furnace chamber and led through the charge. The product is removed from the furnace in an unmelting condition, either continuously or at intervals. Two suitable types of

furnace are described. The first is of the ordinary shaft-furnace type, open at the top, one electrode hanging down into the shaft, and the other consisting of the furnace lining. The raw material is fed into the top of the furnace and is removed from the bottom through a water-cooled opening. Nitrogen is blown in through a pipe at the lower end of the furnace and reaction gases pass out at the top. The second furnace is of the closed type, the chamber being of such a shape that one or more free spaces exist between the charge and the walls. The electrodes pass through holes in the wall of the furnace and through the free spaces before entering the charge. The nitrogen may be led in at the bottom of the furnace or through the spaces surrounding the electrodes into the free spaces. The material is fed into the top of the furnace and removed at the bottom.—L. A. C.

Carbon monoxide; Process for removing — and manufacture of a material therefor. South Metropolitan Gas Co., and J. M. Somerville, London. Eng. Pat. 122,731, 29.6.18. (Appl. 10,767/18.)

CARBON monoxide is removed from gases by passing the gases over caustic alkali containing ferric oxide, to the extent of not more than 50% of the mixture, at about 400° C., i.e. above the temperature at which alkali formate is produced. The material is prepared by adding an equal weight of precipitated anhydrous ferric oxide to a hot saturated solution of commercial caustic soda. The pasty mass is stirred until it is of the consistency of hard putty after which it is heated to 130°–150° C. until loss of water ceases, and then to 320°–350° C. for about three hours. The product is then broken up to a suitable size.—L. A. C.

Alumina; Production of —. R. H. McKee, Ridgefield Park, N.J. U.S. Pat. 1,250,269, 7.1.19. Appl., 9.6.17.

ALUMINA is prepared from acid-soluble aluminous materials containing iron by dissolving the material in an acid, fractionally removing iron by electrolysis, and then electrically precipitating aluminium hydroxide. The acid solvent is regenerated thereby and is used for dissolving fresh material.—L. A. C.

Hydrogen; Treatment of spathic iron-ore for use in the manufacture of —. The British Oxygen Co., Ltd., London, S. W. Bray, Manchester, and I. H. Balfour, Buckhurst Hill, Essex. Eng. Pat. 122,474, 23.1.18. (Appl. 1337/18.)

SPATHIC iron-ore for use in the production of hydrogen by alternate reduction and then oxidation by the action of steam is first treated by allowing the ore, broken into pieces of suitable size for use, to stand for about $\frac{1}{4}$ hr. in a vessel containing sufficient commercial hydrochloric acid or other mineral acid to cover the material completely. The ore is then removed, washed, and allowed to drain. Ore so treated is rendered more porous, and remains active for a longer time, and the yield and purity of the hydrogen are much improved.—L. A. C.

Aluminium carbide; Art of producing —. Standard Oil Co., Assignees of M. Barnett and L. Burgess, New York. Eng. Pat. 112,929, 26.11.17. (Appl. 17,413/17.) Int. Conv., 26.1.17.

SEE U.S. Pat. 1,222,593 of 1917; this J., 1917, 646.

Carbon dioxide; Absorption of — from gaseous mixtures. J. C. H. Kramers, Nijmegen, Netherlands. U.S. Pat. 1,290,244, 7.1.19. Appl., 12.1.16.

SEE Fr. Pat. 490,774 of 1916; this J., 1917, 138.

Reactions in gases in closed systems; Process for the production of — J. L. La Cour, Assignor to Norsk Hydro-Elektrisk Kvaestofaktieselskab, Christiania. U.S. Pat. 1,290,584, 7.1.19. Appl., 17.11.15.

SEE Fr. Pat. 480,205 of 1915; this J., 1917, 215.

Vessels for acids. Eng. Pat. 122,661. See I.

Decolorising carbon [from kelp]. U.S. Pat. 1,290,002. See IIb.

Alkali-bearing rocks. Ger. Pat. 308,690. See IX.

VIII.—GLASS; CERAMICS.

Plastic clay; Determination of air in — H. Spurrier. J. Amer. Ceram. Soc., 1918, 1, 710—713.

As kerosene does not disintegrate clay nor dissolve air, the air in a clay paste may be determined by placing a weighed or measured specimen in a flask filled with kerosene and connected with a gas-measuring tube which is also filled with kerosene. The kerosene in the flask is then displaced by boiling water which disintegrates the clay, any air thus liberated being collected in the measuring tube. The flask is heated by immersion in a water bath and the collecting bottle for the liquid displaced from the measuring tube is connected with a vacuum pump so as to expand and facilitate the collection of the air. After about 15 mins., the pump is disconnected, and the volume of air is measured. A sample of fire-air filter-pressed clay was found to contain 9.61% by vol. of air; the same clay after passing through a pug-mill contained 9.88%. Another sample after passing five times through a pug-mill contained 13.8% of air. This method lends itself to determining the proper setting of the blades in the pug-mill as well as the soundness of the pugged material. A pug-mill is not an efficient apparatus for making a plastic paste and over-pugging may spoil a clay by the introduction of excess of air. When a piece of clay paste is placed in boiling water, the manner in which it "slakes" indicates the manner of its formation. An extruded sample broke down in longitudinal lines, a thrown sample along spiral lines, and a section cut from a filter-press cake did not disintegrate at all. The disintegration is attributed to the disruptive effect of air vesicles expanding under the increased temperature.—A. B. S.

Sagger clay and mixtures. G. H. Brown. J. Amer. Ceram. Soc., 1918, 1, 716—729.

FAILURES of saggars may be caused by too rapid heating, especially if they are not dry; by too rapid cooling, this being the commonest cause of leakage; or by the use of vitrifiable wad-clay which necessitates the saggars being struck to separate them when emptying the kiln. A sagger material when burned should rapidly reach an equilibrium of porosity and shrinkage. The mechanical strength of the saggars in use depends on the amount of vitrification which occurs, the grading and proportion of the grog, and the presence or absence of hair cracks, due to too coarse grog, faulty grains, or a hard clay with excessive shrinkage. Resistance to deformation is obtained by avoiding an excess of fluxes. Resistance to temperature changes, especially in cooling, is increased by avoiding the use of clays containing free quartz (sand). The material should be free from iron and all materials likely to cause "popping" or

"spitting." Saggars should be made of clay which remains porous at all temperatures attained in use and the employment of a second quality kaolin or the addition of 10% or more of kaolin to a sagger clay is recommended. A wet pan is stated to be better than a soaking pit even when the clay from the latter is subsequently pugged—and permits a larger proportion of grog to be introduced and the plasticity of the clay to be developed to the fullest extent.—A. B. S.

Porcelain; Certain characteristics of — A. V. Bleining. J. Amer. Ceram. Soc., 1918, 1, 697—702.

PORCELAINS differ widely in some of their physical properties on account of the various stages of development represented by different samples. In porcelains fired at cone 10 the amount of undissolved quartz is large and that of sillimanite is small, and such products, when heated, are subject to the change in volume coincident with the conversion of quartz to cristobalite. In electrical insulators the proportion of free quartz permissible should probably be quite low and the use of a high clay content is therefore desirable. By replacing quartz by clay or synthetic sillimanite, porcelain of excellent stability to sudden changes of temperature has been obtained. This was particularly the case with a sillimanite prepared by grinding kaolin 258 parts, anhydrous alumina 102, and boric acid 7.2 parts, and heating the mixture to cone 20. Porcelains containing 40% of sillimanite calcine or other minerals such as fused alumina, zirconia, etc., which are not subject to molecular transformation, 40% of clay, and 20% of flux when burned at cone 16 showed high resistance to sudden heating and cooling and high mechanical strength. The addition of sillimanite or analogous minerals increases the firing range of feldspathic porcelains. Bodies containing zirconia seem to be specially desirable where high mechanical strength is necessary. The electric conductivity of porcelains and other vitrified bodies increases rapidly with the temperature. If R is the electrical resistance of the material in ohms, t the temperature in $^{\circ}\text{C}$., and a and b are constants, $\log_{10} R = a - bt$. The chief factor in increasing the conductivity is feldspar and by the elimination of this material from the ware the latter could be obtained with a resistance of 1 megohm per cm. cube at 800°C . (fused quartz has the same resistance at 880°C). With a high feldspar content the polarisation phenomena become more prominent, showing that feldspar acts as an electrolyte. Feldspar and quartz should not be present in porcelains required for use with high electrical tensions.—A. B. S.

Enamels for cast iron. H. F. Staley. J. Amer. Ceram. Soc., 1918, 1, 702—709.

Boric oxide and lead oxide are the only fluxing oxides permissible in large proportions in tin enamels. Boric oxide is always used, but the amount of lead oxide may vary from 0 to 25% on the melted batch. Leadless enamels must be rich in boric oxide, soda, and cryolite. With less than 10% of lead oxide the boric oxide is usually over 8%; in America low-lead enamels are usually rich in zinc oxide. In enamels containing 16—25% of lead oxide, the boric oxide may be as low as 6%, though preferably 7—8%, so as to give greater strength and elasticity. The remaining fluxing oxides do not exceed 10%. The tin oxide (opacifier) varies from 8 to 18% of the melted batch. Antimony enamels may contain sodium metantimonate as the opacifying agent. German leadless enamels of this type are generally rich in boric oxide, whereas

American products are generally high in zinc oxide. In enamels with only 3–5% of lead oxide, the boric oxide and zinc oxide are somewhat lower than in the leadless enamels and the amount of each of the other fluxes is kept low. In enamels with 5–12% of lead oxide the boric oxide is lower than in the preceding type but is higher than in the corresponding tin enamels and the percentage of other fluxes is kept low. In some cases calcium carbonate is replaced by fluorspar in order to maintain the proper lime content and to produce a good colour. Antimony oxide may be used as the opacifier in association with much sodium nitrate but a corresponding low proportion of other sodium compounds and a considerable amount of cryolite. The characteristics of such enamels correspond closely with those containing sodium metantimonate; possibly this compound is formed *in situ*. —A. B. S.

PATENTS.

[Glass] furnaces. T. B. Kitson, Leeds. Eng. Pat. 122,672, 27.12.17 (Appl. 19,116/17.)

In a reverberatory furnace for use in glass manufacture, the air is preheated by passing it first through a flue beneath the bottom of the furnace, then through vertical flues at the end of the furnace, and finally through an unobstructed chamber or flue between the furnace crown and an upper flue, through which the waste gases from the furnace pass. The air and waste gases both flow in the same direction. The exhaust ports or outlets of the furnace also serve as troughs or spouts for feeding glassware machines, the glass in them being kept hot by the waste gases impinging on it with a blow-pipe action.—A. B. S.

Fireclays; Art of purifying —. H. L. Kohler, St. Louis, Mo. U.S. Pat. 1,290,241, 7.1.19. Appl., 31.7.18.

A FALLING charge of the dried crushed fireclay is subjected to transverse currents of air; the heavy particles of sand and felspar are deposited, whilst the relatively light particles of clay are carried along by the air and circulated around one or more magnetised deflecting plates to separate magnetic impurities, after which the "pure silicate of aluminium" is recovered.—A. B. S.

Enamelling furnace. A. J. Boland, St. Louis, Mo. U.S. Pat. 1,290,060, 7.1.19. Appl., 14.5.17.

In a muffle enamelling furnace the vertical side flues are arranged in pairs with a longitudinal connecting flue along the top and an escape conduit extending through the furnace wall. The flues in each pair are provided with a left- and right-hand burner respectively below the level of the muffle floor; these burners direct the heating gases partly horizontally beneath and around the muffle and partly vertically along its sides.—A. B. S.

Enamelled ware; Method of marking [decorating] —. W. J. Kohler, Sheboygan, Wis., Assignor to Kohler Co., Kohler, Wis. U.S. Pat. 1,290,580, 7.1.19. Appl., 6.1.16.

The article to be marked is provided with a ground coat of binding material; it is then heated to a white heat, a coat of powdered enamel is applied, the article is again heated so as to fuse the first coat of enamel, and whilst it is hot a second coating of enamel is applied. Lines of marking enamel of a different colour are then applied and the article is re-heated so as to fuse the second coating of enamel and form a smooth surface. —A. B. S.

Refractory product. L. P. Kraus, jun., New York. U.S. Pat. 1,289,049, 24.12.18. Appl., 13.2.15. Renewed 29.3.17.

A SHAPED kiln-burned refractory product is formed from compressed or moulded refractory material having clinkered grains of a spongy character and rough irregular outline, combined with a bond. —D. F. T.

Abrasive articles; Methods of making —. The Carborundum Co., Ltd., Manchester. From H. Urtel, La Salle, N.Y., U.S.A. Eng. Pat. 122,533, 2.3.18. (Appl. 3707/18.)

SEE U.S. Pat. 1,243,783 of 1917; this J., 1917, 1275.

Kilns. Eng. Pat. 122,742. See I.

Kiln. U.S. Pat. 1,290,848. See I.

IX.—BUILDING MATERIALS.

Portland cement; Solubility of — and its relation to theories of hydration. J. C. Witt and F. D. Reyes. Philippine J. Sci., 1918, 13, 147–161.

WHEN Portland cement is shaken with water free from carbon dioxide in a closed vessel, large amounts of lime and relatively small amounts of most of the other oxides are dissolved. When the weight of water is 8000 times that of the cement 90% of the lime goes into solution in 24 hours. Hence, under favourable conditions all the important compounds in cement may be rapidly hydrated with formation of calcium hydroxide. The constituents and concentration of the solution depend on the method and duration of agitation, the size of the cement particles, and the proportions of cement and water, especially the last. There appears to be no relation between the percentage of lime dissolved and the amount of the other constituents present. It has not been found possible to obtain a saturated solution of calcium hydroxide by shaking cement with water. The addition of a larger proportion of water in gauging facilitates hydration and should therefore increase the strength of the cement, but this is more than counterbalanced by the leakage of water from the mixture with consequent loss of lime and cohesion. Hence, the net effect of an excess of water is to reduce the strength of the mixture. This is confirmed by the fact that if a mixture containing an excess of water is evaporated until only the normal amount of water is present, the strength is increased.—A. B. S.

Calcium aluminates; Hydraulic properties of the —. P. H. Bates. J. Amer. Ceram. Soc., 1918, 1, 679–696.

ALL the aluminates of the lime-alumina-silica system possess hydraulic properties except $3\text{CaO}\cdot\text{Al}_2\text{O}_3$. The last-named decomposes at about 1535°C . into CaO and a liquid. If the product is reground and reburned at 1350°C . for several hours the aluminate may be obtained free from any lime. Pure tricalcium aluminate when ground and mixed with water agglomerates into masses only the exteriors of which are hydrated. Pats of the paste show an initial set in about three hours and a final set in 48–72 hours, but the interior of the pats is quite soft and if the pats are left in a moist atmosphere they become soft throughout in a week. When placed in water they disintegrate completely, forming a colloidal gelatinous material which soon crystallises. If tricalcium aluminate is mixed with less than 10% of lime and then with water, a smooth plastic paste, which hardens like Portland cement, is produced.

$5\text{CaO}, 3\text{Al}_2\text{O}_3$, when ground reacts so readily with water that it is difficult to handle except in the presence of a large excess of water (which gives products of low strength) or of 3% of gypsum, which retards the action. The products of the action are hydrated tricalcium aluminate and gelatinous hydrated alumina. $\text{CaO}, \text{Al}_2\text{O}_3$, and $3\text{CaO}, 5\text{Al}_2\text{O}_3$, both set slowly and harden rapidly and attain high strengths. Eight mixtures, consisting chiefly of lime and alumina, with varying quantities of silica and ferric oxide, were burned at temperatures ranging from 1360°C . to 1500°C . Those which approached most closely to $3\text{CaO}, 5\text{Al}_2\text{O}_3$, required the longest time to set. Those corresponding to $\text{CaO}, \text{Al}_2\text{O}_3$, had a quick initial set but a normal final set. The results with the other mixtures show that the setting time depends on the lime-alumina content. The constituents other than the aluminates ($2\text{CaO}, \text{Al}_2\text{O}_3, \text{SiO}_2$; $2\text{CaO}, \text{SiO}_2$) did not appear to affect materially any of the properties, but acted merely as non-hydraulic diluents. The addition of 3% of plaster of Paris accelerated the setting. All the mixtures (except two) gave high tensile strength tests when mixed with sand and stored in a damp place for a year, and several of them had, after 24 hours, a greater strength than Portland cement after 28 days. One mixture (Al_2O_3 74.1, CaO 23.8, SiO_2 0.7, Fe_2O_3 0.4, MgO 0.8, loss on ignition 0.4%) gave a 1:3 mortar which developed a tensile strength of 770 lb. per sq. in. in 90 days and 960 lb. in 26 weeks, and a crushing strength of 8610 lb. at 7 days and 10,690 lb. at 28 days. Somewhat lower strength tests were obtained when plaster of Paris was added. Storage under water greatly increased the strength of the material, but storage in a damp place tended to reduce it. The commercial possibilities of calcium aluminate cements are not promising as the alumina would be too costly.

—A. B. S.

Potash in cement-mill dust; Nature of the recombined. — A. R. Merz and W. H. Ross. J. Ind. Eng. Chem., 1919, 11, 39–45.

The water-soluble potash in cement dust consists chiefly of potassium salts volatilised in the burning of the cement; smaller quantities are derived from silicates carried over mechanically in the dust, and from the coal ash. The water-insoluble but acid-soluble potash present in the dust is due to re-combination of a portion of the volatilised potassium salts with the coal ash, to recombination, under certain conditions, with the silicious material occurring in the raw mix, and to partial decomposition of the silicates of the raw mix and of the coal ash carried over mechanically. The acid-insoluble portion of the potash consists of undecomposed silicates and coal ash, and of substances formed by re-combination of the volatilised potassium salts with the coal ash when the amount volatilised is small. This re-combined potash is of the nature of potash slag or impure glass; it is probable that the extent of the re-combination would be reduced if the burning of the cement were carried out under oxidising rather than reducing conditions, and also by any process which would introduce lime or sodium chloride into the dust at the hottest part of the kiln.—W. P. S.

Calcium aluminium sulphate as a destroyer of concrete. H. Nitzsche. Z. angew Chem., 1919, 32, 21–24.

CALCIUM aluminium sulphate was first synthesised by Candiot, and was shown by Michaëlis in 1892 to have the formula $\text{Ca}_2\text{Al}_2\text{O}_7, 8\text{CaSO}_4$, with $30\text{H}_2\text{O}$ if produced in a cold solution and $12\text{H}_2\text{O}$ if produced in a hot one. Its existence in mortar and concrete

was not definitely proved until 1917. It may be produced by adding aluminium sulphate solution to lime water or by mixing lime water and precipitated alumina with a solution of any sulphate. It is also formed when water containing sulphates comes in contact with cement, and the crystallisation pressure of the highly hydrated crystals causes the concrete to crack as soon as the pores cannot contain any further quantity of crystals. The crystals are only stable in the presence of lime water; in water they dissociate into calcium sulphate, calcium hydroxide, and alumina; the two former are dissolved more or less completely and the alumina forms a white flocculent mass. The crystals are still more rapidly dissociated in solutions of salts or acids and in sea water. The relative harmfulness of a water or solution towards cement or concrete may be judged by comparing the crystals produced when lime and alumina are allowed to interact in its presence. Comparative results are obtained in a few days. No crystals of the double salt were produced in a long series of such tests using either natural or artificial sea water, nor could they be found in test mortars which had been immersed for a prolonged period in sea water. Consequently the destructive action of sea water on concrete must be referred to other causes and not to the sulphates present. The destruction of concrete by surface water, moorland (peaty) water, sewage, or sulphate solutions may be attributed to the formation of the double salt. The author has found crystals of calcium aluminium sulphate in many samples of concrete and mortar taken from structures exposed to the action of sulphate solutions. The crystals may be readily recognised by microscopical examination, using a magnification of 50–100 diameters; the examination should not be made on completely disintegrated material, because after disintegration of the concrete the calcium aluminium sulphate is rapidly decomposed. The presence of a white aluminous mass is an indication that disintegration has been caused by the double salt. A very dilute sulphate solution or a water with a low SO_4 -content will, in time, destroy a structure exposed to it, if sufficient lime is present in the cement or mortar to prevent dissociation of the double salt. Preventive measures are of two kinds, viz., the use of concrete of such a nature that the harmful fluids cannot penetrate it, and the use of resistant materials in the cement. The concrete may be made waterproof by coating it with bitumen, asphalt, or tar, but such treatment is usually too costly. The concrete may be rendered resistant by using cement containing iron oxide in place of alumina, or by use of blast-furnace slag-cements low in lime; the latter is at present one of the most certain preventives. Alternatively silicious material may be added, such as puzzuolana, trass, brick dust, granulated slag, santorin earth, etc., which will combine readily with the lime set free by the action of water on the cement. Such materials reduce the porosity of the cement, but their chief action is in converting the lime into a compound which cannot take part in the formation of the double sulphate. The reaction between the lime in the cement and the silica in the added material is, however, very slow, and such materials do not invariably prevent the formation of the double salt.—A. B. S.

Mixed crystals of calcium ferrite and aluminate. Campbell. See VII.

PATENTS.

Artificial stone. A. Afford, Romford. Eng. Pat. 122,546, 18.3.18. (Appl. 4752/18.)

An artificial stone composed of broken "free stone," Bath stone or Weldon stone, and Portland cement mixed together in a wet condition and

moulded into blocks, slabs, or other forms. The product is stronger than natural Bath or Weldon stone.—A. B. S.

Mineral [slag] wool; Manufacture of — G. A. Herdman, Redcar. Eng. Pat. 122,779, 21.6.18. (Appl. 10,283/18.)

DAMP-PROOF mineral wool or slag wool is made by projecting molten slag from a cupola into a receiving chamber by means of a steam blast into which a dust-settling and damp-proofing liquid (oil) is introduced, whereby the resulting fine filaments of slag become impregnated with the fluid. If air or other gas is substituted for steam in the blast the oil should be used in a hot state. The receiving chamber has a number of air vents at the top, one of which is placed directly above the entry tube and another at a point diagonally opposite the first.

—A. B. S.

Alkali-bearing rocks; Treatment of — [for production of cement with volatilisation of the alkali]. F. Krupp A.-G. Grusonwerk, Magdeburg-Buckau. Ger. Pat. 308,690, 24.6.14. Addition to 304,080 (this J., 1918, 374A).

THE alkaline-earth (calcium) salts specified in the chief patent may be replaced by salts of other bases suitable for use in the production of Portland cement, for example iron or aluminium salts or the like. If iron salts, e.g., ferrous sulphate, are used, the addition of ferric oxide may not be needed.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron in iron ores; Determination of — by permanganate. R. Schwarz and B. Rolfs. Chem.-Zeit., 1919, 43, 51.

THE titration of ferrous chloride by permanganate in presence of hydrochloric acid and manganous sulphate always gives rather too high results owing to the oxidation of a little of the hydrochloric acid, in spite of the presence of the manganous salt. The addition of colloidal silicic acid entirely prevents the oxidation of the hydrochloric acid in the presence of manganous sulphate. The silicic acid is added in the form of a solution of sodium silicate, containing about 0.1 gm. of SiO_2 per 1 c.c. After the addition, it is important that the silicic acid remain in colloidal solution, unflocculated; the titration should therefore be made without delay. The iron ore, 4–5 grms., is dissolved in boiling concentrated hydrochloric acid, 10–12 c.c. per 1 gm. of ore, the solution is made up to 500 c.c. and 50 c.c. taken for the titration. It is reduced with stannous chloride, the excess of which is removed by mercuric chloride; 10 c.c. of manganous sulphate and phosphoric acid mixture is added and about 5 c.c. of "water-glass" solution of sp. gr. 1.17. The solution is then titrated with permanganate standardised in the ordinary way.—J. F. B.

Steels; Influence of different factors on the critical velocity of quenching [hardening] of carbon —. Portevin. Comptes rend., 1919, 168, 346–348. (See also this J., 1917, 720.)

CONSIDERING the time of quenching as a function of the diameter of homothetic cylinders (having a length equal to three times the diameter), and the hardness as a function of the time of quenching or the diameter it is shown that for a carbon steel, containing C 1.07%, Mn 0.08%, the ratio of the time of cooling (from 700° to 200° C.) to the diameter is given graphically by two straight lines, one

corresponding to cylinders above 14 mm. and the other to cylinders below 13 mm. in diameter. The hardness of the quenched steel also undergoes a sudden change of about 200 Brinell units between these two diameters. Analogous results are obtained with other steels at different diameters according to the character of the steel. These two phenomena are the consequence of the sudden lowering of the transformation temperature and of the change in the microstructure from troostitic to martensitic. The critical velocity of quenching, or more exactly the region of velocities of cooling in which this sudden change of phenomena occurs, appears to be the most characteristic property in the hardening of steels. The critical velocity is notably influenced by the manganese content of the steel, decreasing with it. The minimum temperature of quenching for effective hardening is a function of the velocity of cooling, and is lower as the velocity is higher. A comparison of Chevenard's results (see this J., 1917, 881) using a steel wire, 0.32 mm. diameter, with those for a cylinder 20 mm. in diameter made of steel of almost identical carbon and manganese content, lends support to the view that pressure plays an important part in the formation of troostite.—W. G.

Iron alloys; Dependence of the magnetic properties, specific resistance, and density of — on their thermal treatment. E. Gumlich. Z. Elektrochem., 1918, 24, 372–377. (See this J., 1918, 374A.)

FOR pure electrolytic iron the following values were obtained: Sp. gr., 7.876; specific resistance per sq. mm. 0.0094; temperature coefficient of the resistance between 20° C. and 100° C., 0.57%; saturation value, $4\pi J \propto = 21620$, where J is the intensity of magnetisation. These values were very little changed by annealing and stand in contrast to the magnetic properties. The improvement in the magnetic properties brought about by annealing is not due, as generally believed, to a molecular change, but to the removal of adsorbed gases. In the iron-carbon alloys the transition points found correspond with those given by the equilibrium diagram. The carbon content has a marked effect on the coercive force, especially in low-carbon alloys; the effect is much greater in the case of quenched alloys than in those of pearlitic structure. The presence of silicon diminishes the magnetic properties; this substance behaves like a non-magnetic impurity which diminishes the magnetic properties of the iron. The presence of aluminium affects the iron in much the same way as silicon; the specific resistance increases nearly proportionally to the aluminium content. The second transition point is lowered 100° C. by 10% Al. The manganese alloys show similarities to the carbon alloys. The coercive force of the slowly cooled alloys is extraordinarily high, and with 10% Mn has a value of 60 gauss, whereas the retentiveness disappears with 14–16% Mn.—J. F. S.

Phosphorus; Determination of — in vanadium steels, ferrovanadium, non-vanadium steels, and pig-iron. C. M. Johnson. J. Ind. Eng. Chem., 1919, 11, 113–116.

THE methods described below require the following solutions. Nitric acid for titrating: 35.4 c.c. of nitric acid (sp. gr. 1.42) diluted to 4000 c.c. with distilled water. Sodium hydroxide solution: A stock solution is prepared by stirring 150 grms. of pure sodium hydroxide and 1 gm. of barium hydroxide with 1000 c.c. water, decanting or filtering the solution after 24 hours, and diluting with an equal volume of water; the solution for titrating is

prepared by diluting 566 c.c. of the stock solution to 8000 c.c. with water. Ferrous sulphate solution: 55 grms. of steel (low in phosphorus and sulphur) is dissolved in 720 c.c. of sulphuric acid (1:3), a little water being added occasionally to prevent salting out and the liquid heated gently but not boiled, filtered, cooled, and diluted to 1000 c.c. Potassium permanganate solution: 50 grms. in 1000 c.c. of water. Nitrate wash: 8 grms. of potassium nitrate in 8000 c.c. of water. Acid wash: 102.4 c.c. of nitric acid (sp. gr. 1.42) diluted to 8000 c.c. with water. Faintly ammoniacal ammonium molybdate solution: Into each of four beakers are weighed 50 grms. of ammonium molybdate and 50 grms. of ammonium nitrate, to which 40 c.c. of ammonia solution (sp. gr. 0.95) is added; each solution is diluted to 700 c.c. with water, then heated for about 30 minutes with occasional stirring until all the salts are in solution. The contents of the four beakers are united in a large bottle, diluted to 4000 c.c. with water, left overnight, and the insoluble matter removed by filtration through double 15 cm. filter-papers but not washed. The clear solution thus obtained should remain clear indefinitely.

I. *Steel containing vanadium up to 2.6%.* 1.63 grm. of the sample is dissolved in 45 c.c. of nitric acid (sp. gr. 1.13) over a low flame; when the solution is clear and brown fumes have been expelled, 3 c.c. of permanganate solution is added and the liquid boiled for 3 minutes, 3 c.c. of the ferrous sulphate solution being then added to dissolve the precipitate caused by excess of permanganate and the solution boiled until brown fumes disappear; large excess of ferrous sulphate is to be avoided. After addition of 40–50 c.c. of concentrated nitric acid (sp. gr. 1.42) the liquid is brought to the boil, the cover and sides of the beaker being then rinsed with the least possible quantity of water and 50 c.c. of the ammonium molybdate solution added. The whole is stirred vigorously for a minute or two and left overnight, after which it is decanted through a 7 cm. filter-paper with a little paper pulp in the apex, the main precipitate being left in the beaker. Iron is removed by washing 15 times with the nitric acid wash and the main precipitate then introduced into the filter as far as possible with the aid of the nitric acid wash; about 2 c.c. of the latter is added to the beaker and adhering particles removed with a rubber-tipped rod, the washings being caught in a separate beaker. The precipitate is washed 15 times with the nitric acid wash and then 25 times with the potassium nitrate wash or until the outside of the filter, especially along the double thickness, has no sour taste. To the washed precipitate, in a 150 c.c. beaker, enough of the standard sodium hydroxide solution is added to cause the yellow colour of the precipitate to disappear on macerating the paper to a pulp with a rubber-tipped rod. The volume is made up to about 30 c.c. with water and a drop of phenolphthalein added; this should produce a deep red coloration, otherwise more sodium hydroxide solution is needed. The liquid is then titrated back with standard nitric acid solution until the pink colour just disappears. The difference in c.c. between alkali and acid solutions multiplied by 0.01 gives the percentage of phosphorus in the steel.

II. *U.S. standard steels and pig-irons to which 28% of vanadium has been added; also ferrovanadium containing 56.7% vanadium.* 0.5 grm. of steel and 0.5 grm. vanadium pentoxide (56.14% V) are digested in a 250 c.c. porcelain dish with a mixture of 30 c.c. of hydrochloric acid (sp. gr. 1.20) and 30 c.c. of nitric acid (sp. gr. 1.42) for about an hour, the cover being rinsed and the liquid evaporated to dryness with 100 c.c. of nitric acid (sp. gr. 1.42). The residue is baked for 5 minutes at 750° in an

electric muffle furnace, the oxides dissolved in 35 c.c. of concentrated hydrochloric acid, the liquid evaporated to 10 c.c., and, after addition of 50 c.c. of nitric acid (sp. gr. 1.42), again to 10 c.c., and then heated with 10 c.c. of concentrated nitric acid with the cover-glass on the dish. The solution is filtered by suction through a platinum Gooch crucible with a thin pad of acid-washed asbestos, which is afterwards washed 15 times with a mixture of 200 c.c. of nitric acid (sp. gr. 1.42), 100 c.c. of water and 20 grms. of ferric nitrate [the ferric nitrate is made by dissolving 5 grms. of melting bar steel low in phosphorus in 50 c.c. of hydrochloric acid (1:1) and evaporating to a syrup twice with 50 c.c. of nitric acid (sp. gr. 1.42) each time]. The filtrate from the separated vanadium pentoxide is concentrated to 10 c.c. in a 150 c.c. beaker and the second crop of vanadium "rust" filtered off as before; a third concentration to 10 c.c. should show no "rust" (V_2O_5). After the third concentration the liquid is brought to the boil with 40 c.c. of nitric acid (sp. gr. 1.42), the cover and sides of the beaker being rinsed with water and the liquid precipitated with 50 c.c. of the faintly ammoniacal ammonium molybdate solution, the whole being stirred vigorously for about 2 minutes. After an hour the solution is filtered and washed as described under I, titration with alkali and acid being then carried out in the usual manner.

III. *Non-vanadium steels or pig-iron.* 1.63 grm. of the sample is dissolved in 45 c.c. of nitric acid (sp. gr. 1.13). (In the case of pig iron and certain chrome steels, when all the metal is dissolved the carbon residue is collected on a 7 cm. filter-paper and washed 15 times with dilute nitric acid wash, the filtrate being caught in a 150 c.c. beaker and concentrated to the original volume.) The solution is boiled for 3 minutes with 3 c.c. of the potassium permanganate solution, just sufficient of the ferrous sulphate solution (about 3 c.c.) being afterwards added to dissolve the oxides of manganese. The brown fumes are expelled by boiling, 15 c.c. of nitric acid (sp. gr. 1.42) is added, the cover and sides of the beaker are rinsed with the least possible amount of water, 50 c.c. of the ammonium molybdate solution is added, and the liquid is stirred briskly until the phosphorus precipitate is completely formed (about 2 minutes). After standing for half an hour or less the solution is filtered through a 7 cm. paper, which is washed 15 times with the nitric acid wash and then with the nitrate wash until the outside fold of the filter-paper has no sour taste; with samples rich in phosphorus 35–40 washings may be necessary. The subsequent procedure is as described above.—T. H. P.

Tinning of cast iron. E. A. Schott. *Stahl u. Eisen*, 1919, 39, 119–124.

In the usual process, the articles are pickled in dilute acid and then scoured with pebbles, basalt fragments, etc., in rotary drums to free the surface from graphite. The cleaned moist pieces are then digested with dilute cupric chloride solution to which a little cyanide is added from time to time. When a thin film of copper has deposited, the articles are dipped, while still wet, into tin heated 80°–150° C. above its melting-point, the bath being kept covered with palm oil or wool fat to prevent oxidation; this covering is removed during introduction and withdrawal of the articles; a perforated lid is used to keep the articles immersed while the bath is being heated up to its former temperature. The bath, in dissolving small amounts of iron, becomes gradually contaminated with a tin-iron alloy; for this reason, tinning is generally done in two stages, first in a bath of impure tin, then in pure tin. The articles

after being freed from excess tin by shaking are cooled by a cold air fan or by quenching in water. Improperly tinned ware may be greatly improved by several immersions in a tin bath covered with fused resin.—W. R. S.

Silver and gold refining; Electrolytic — at Perth Amboy, N.J. G. G. Griswold. Amer. Electrochem. Soc., Apr., 1919. [Advance proof.] 7 pages.

AN illustrated description is given of the treatment of doré bullion, by the Moebius process, at the works of the American Smelting and Refining Co. The bullion forms the anode of an electrolytic cell having a cathode of pure silver, the electrolyte being a neutral solution containing 15–20 grms. of silver and 30–40 grms. of copper per litre (as nitrates); a current density of 40 amp. per sq. ft. is employed. The insoluble residue (gold slime) from the anodes—collected in bags by which the latter are enclosed—is treated with sulphuric acid to remove silver and copper and is then melted and cast into anodes for electrolytic refining by the Wohlwill process. For this purpose, cathodes of thin sheet gold are employed in an electrolyte containing 30% of free hydrochloric acid and 80–85 grms. of gold per litre, the current density being 150 amp. per sq. ft.—W. E. F. P.

Gold amalgams rich in gold. N. Parravano and P. Jovanovich. Atti R. Accad. Lincei, 1918, 27, ii, 364–368. (Compare this J., 1919, 42 A.)

THE course of the specific electrical conductivity curve for gold amalgams containing from 0 to 10% Hg indicates that such amalgams rich in gold consist of solid solutions of mercury in gold. (Compare J. Chem. Soc., Apr., 1919.)—T. H. P.

Silver amalgams rich in silver. N. Parravano and P. Jovanovich. Atti R. Accad. Lincei, 1918, 27, ii, 411–412.

THE specific electrical conductivity curve for silver amalgams containing 0–14% Hg consists of two branches: The first, from 0 to about 2% Hg, has the form characteristic for solid solutions, and the second, from about 2 to 14% Hg, is a straight line, which is characteristic of alloys composed of two crystalline individuals, these being saturated mixed crystals with 2% Hg and the compound, Ag₂Hg. (Compare J. Chem. Soc., Apr., 1919.)—T. H. P.

Copper; Action of reducing gases on hot solid —. N. B. Pilling. J. Franklin Inst., 1918, 186, 373–374.

COPPER containing disseminated copper oxide is rendered weak and friable by heating in a reducing gas such as hydrogen, carbon monoxide, etc. The suggested explanation is that the reducing gas is more soluble in the copper than the steam or other gas which results from the reducing action on the copper oxide, and that a considerable internal pressure is set up which produces a separation of the individual grains. Comparative diffusion rates through copper at 700° C. supported this view; taking the rate of diffusion of hydrogen as 1000, that of steam was found to be 65, carbon monoxide 17, and carbon dioxide 0.6. Similar results were obtained by noting the depth to which the oxide was reduced. In the case of hydrogen the action begins between 400° C. and 500° C. The effect is more strongly marked with cast copper in which the oxide is segregated as a eutectic at the grain boundaries than with wrought copper where the oxide particles are uniformly disposed throughout the grains.—B. V. S.

Zinc blende; Gases escaping from the muffles during reduction of roasted —. O. Mühlhaeuser. Metall u. Erz, 1918, 15, 431–436.

A NUMBER of analyses of gas given off during the distillation of roasted blende with Pennsylvanian anthracite are tabulated. From the results it is deduced that a good deal of gas penetrates into a new muffle from the furnace; this quantity decreases from day to day until a minimum is reached after about 8 days. The presence of fire gases in the muffles must be due chiefly to reciprocal diffusion of reaction and fire gases. The position occupied by a muffle in the furnace appears to be without influence on the composition of the escaping gas.—W. R. S.

Cadmium [in brass]; Determination of — by the hydrogen sulphide method. E. Schramm. J. Ind. Eng. Chem., 1919, 11, 110–113.

THE literature of the subject is reviewed and the general considerations governing the estimation of cadmium in brass discussed, the following procedure being finally adopted: Ten grams of the brass is dissolved in 75 c.c. of nitric acid (1:1), the solution is boiled for half an hour, the metastannic acid filtered off, and the filtrate diluted to 350 c.c., this bringing the concentration of nitric acid to about 3%. After addition of 10 c.c. of sulphuric acid (1:1), the liquid is electrolysed for about 2½ hours with a current of 4 amperes, a rotating cathode being used, until nearly all the copper is removed. The electrolyte is siphoned off and, after addition of a further 10 c.c. of sulphuric acid, evaporated nearly to dryness. The residue is dissolved in 100 c.c. of water, the solution neutralised with ammonia and treated with 5 c.c. of sulphuric acid (1:1), and hydrogen sulphide passed through the cold solution for 30 minutes until the sulphides settle. Ammonia is added until zinc begins to precipitate and hydrogen sulphide then again passed through for 30 minutes; the liquid is filtered, water containing ammonium chloride and hydrogen sulphide being used to wash the precipitate from the beaker. The precipitate is boiled for 15 minutes with 20 c.c. of sulphuric acid (1:5), the volume being maintained by occasional addition of water; the liquid is filtered and the precipitate washed, the volume being kept down to 50 c.c. Through the filtrate, treated with 5 c.c. of concentrated ammonia, hydrogen sulphide is passed for half an hour, ammonia being then added until the cadmium begins to precipitate. The solution is filtered and the precipitate treated with a little cold hydrochloric acid (1:1), the solution being neutralised with ammonia and treated with 5 c.c. of sulphuric acid (1:5); the total volume should be kept down to about 30 c.c. Hydrogen sulphide is passed through as before and ammonia added to start the precipitation of the cadmium, the liquid being then filtered, the cadmium sulphide dissolved from the filter in a little hydrochloric acid (1:1), and the solution collected in a weighed platinum or porcelain dish, in which it is evaporated with 1 c.c. of sulphuric acid until fumes appear and then treated with a little concentrated nitric acid. The solution is evaporated carefully to dryness and the residual cadmium sulphate weighed. If the presence of tin in this residue is possible, the cadmium sulphate is dissolved in 25 c.c. of water and 5 c.c. of sulphuric acid (1:5) and the cadmium re-precipitated with hydrogen sulphide, a little ammonium chloride being added to the solution. After the sulphide has settled, the supernatant liquid is decanted on to a filter, the precipitate in the beaker being warmed for several minutes with a little ammonium polysulphide and ammonium chloride and the liquid poured on to the filter. The cadmium sulphide is dissolved in hydrochloric acid, the liquid evaporated, and the sulphate weighed as before.—T. H. P.

[*Tin ores*;] *Slime treatment* [of —] on *Cornish frames*: Supplements. S. J. Truscott. Bull. 173, Inst. Min. Met., Febr., 1919. [Advance proof.] 31 pages.

THE experiments previously described (this J., 1918, 376 A) were continued, and the following conclusions are now submitted. While a finely fluted surface is more effective with sand tailings ground to slime, i.e., with material of a granular character, a plane surface is preferable for recovering the finest impalpable tin from the slimy portion of the ore. By reducing the length of the frame bed from 6 to 3 ft., the capacity of the frame was doubled, the longer bed requiring prolonged washing for removing the slime. The inclination of the frame should be such that during the feed about 80% of the gangue is removed; in this case subsequent washing raises the value of the concentrate with small loss in tin. A rate of feed of $4\frac{1}{2}$ tons per day for an 18-ft. round frame and 15 cwt. per day for a straight 6-ft. frame, and a pulp ratio of 1:10 are recommended. A straight frame should be flushed after 4 minutes' feeding; a round frame should make one revolution in about $4\frac{1}{2}$ minutes. Stepped beds are not suitable for slime treatment, as the very fine tin must be given time to settle. It is considered that the present recovery could be obtained with one-half the present frame area, thus giving additional space for re-treatment of tailings, whereby the total recovery could be improved by about 3½%.—W. R. S.

Cassiterite; Comparison of concentration results with special reference to the *Cornish method of concentrating* —. E. Edser. Bull. 173, Inst. Min. Met., Febr., 1919. [Advance proof.] 17 pages.

IN comparing results obtained by the use of different appliances, a difficulty arises from the fact that a greater enrichment is frequently accompanied by a diminished recovery. The method worked out for making the results comparable is based on the assumption that the "waste modulus," $k = \frac{\text{assay of tailings increment}}{\text{assay of concentrate}}$, does not vary as the material is passing over the tables becomes richer and richer in cassiterite. The value of k lies between 1 and 0, for with $k=0$ the tailings contain no tin while with $k=1$ no concentration takes place. The formula $2 - \log (\text{percentage recovery})$ gives the "waste index" n , from which k can be calculated by the equation

$$k = \frac{n}{1+n} \quad \text{—W. R. S.}$$

Nickel; Process for electrologically refining —. G. A. Guess. Amer. Electrochem. Soc., Apr., 1919. [Advance copy.] 4 pages.

IN the process as tested on a laboratory scale, anodes of crude nickel, containing copper and iron, are suspended in a bath of nickel sulphate to which finely divided calcite is added periodically; the cathodes (lead or aluminium) are enclosed in a bag of light canvas mounted on a wooden frame. The copper is precipitated as a basic double sulphate $2\text{CuO} \cdot 2\text{NiO} \cdot \text{SO}_4$ which settles in the form of mud. The latter is fused with silica in graphite pots to a matte containing Ni 36.1, Cu 37.8, and S 19.5%. The matte may be roasted, then reduced to metal and cast into anodes, from which the copper can be recovered electrolytically. The nickel anodes are produced by roasting copper-nickel matte, leaching the calcine with dilute sulphuric acid to extract the bulk of the copper, fusing the dried residue with charcoal, and casting the crude metal. The nickel deposited on the cathode usually contains less than 0.001% of copper.—W. R. S.

Metals and salts; Ultramicroscopic examination of very thin deposits of — produced by evaporation in high vacua. L. Hamburger. Kolloid-Zeits., 1918, 23, 177—199.

THE deposits produced when the metals silver, gold, tungsten, molybdenum, platinum, iron, copper, nickel, magnesium, zinc, and cadmium, as well as carbon, sodium chloride, and calcium fluoride, were heated in vacuo, have been examined ultramicroscopically. Metals with high melting point (molybdenum, platinum, nickel, and iron) and also carbon produce sublimates which are either completely or mainly unresolvable into particles. The lower melting elements with a higher vapour tension (gold, silver, copper, magnesium, zinc, and cadmium) show a great tendency to form a less disperse deposit exhibiting a complete network of ultramicros. Generally the higher the temperature necessary for slow sublimation the finer is the structure of the sublimate. The electrical conductivity of films of gold, silver, platinum, and tungsten, of measured thickness, shows that warming the films from the temperature of liquid air to the ordinary temperature produces a non-reversible resistance change which is very great in the case of silver and gold. (Compare J. Chem. Soc., Apr., 1919.)—J. F. S.

Calcium oxide in lime. Meiklejohn. See VII.

Spectra of iron, cobalt, and nickel. Meggers and Kiess. See XXI.

Action of alkalis on alloys of platinum and of gold. Nicolardot and Chatelot. See XXIII.

PATENTS.

Iron; Manufacturing of —. G. C. Carson, San Francisco. U.S. Pat. 1,287,221, 10.12.18. Appl., 15.5.17.

THE process consists in reducing the ore with carbon produced from natural gas or petroleum, the sulphur from which has been removed in the form of carbon bisulphide.—W. R. S.

Rust-proof coating for iron and steel. W. H. Allen, Detroit, Mich. U.S. Pat. 1,290,476, 7.1.19. Appl., 8.1.17.

A RUST-PROOFING liquid for application to iron and steel consists of a 10% solution of phosphoric acid in water, in which is dissolved about 1% by weight of ferric phosphate.—C. A. K.

[*Crucible*] *smelting furnaces and the like*. J. Tylor and Sons, Ltd., H. T. White, J. Gaunt, and D. Brookfield, London. Eng. Pat. 121,213, 14.1.18. (Appl. 802/18.)

IN furnaces of the type described in Eng. Pat. 114,684 (this J., 1918, 398 A), especially such as are provided with a metal cover forming a preheater for the charge to be melted (see Eng. Pat. 118,750; this J., 1918, 659 A), the products of combustion from the furnace or preferably from a pair of furnaces, are led through a second preheating chamber for the charge to be melted and also through a crucible preheater before passing to the chimney.—C. A. K.

Furnace [for forging, etc.] A. Smallwood, London. Eng. Pat. 122,504, 2.2.18. (Appl. 1925/18.)

A FURNACE is heated by gas from a central gas producer, the gas entering the furnace through two horizontal flues, extending transversely in opposite directions. Waste gases are conveyed from the

sides of the furnace in a downward direction and thence through transverse flues under the working bed, in the direction of, and then away from the gas producer. Finally the gases are led upwards through a narrow flue above the arch of the furnace and into a stack located centrally above the furnace. Intermediate with the hot waste gas flues are similar transverse air passages, the hot air meeting the gas in the horizontal flues before entry into the furnace. Provision is made for the admission of gas from other producers through a branch flue.—C. A. K.

Furnaces for annealing metal plates. W. John, Swansea. Eng. Pat. 122,699, 31.1.18. (Appl. 1808/18.)

A FURNACE adapted to receive trolleys is tapered towards the entrance end. At the wider end of the furnace, a coal fire-box is built at each side of the discharge door, and an additional firebox, adapted for coke, is fitted on each side near the middle of the furnace. Products of combustion are conveyed from the coal fire along the sides of the furnace and over the central coke fire, and are withdrawn at the narrow end of the furnace into a flue connected to a chimney, or they may be conveyed by means of a fan back to the coal fires.

—C. A. K.

Melting and pouring furnace. I. Kormutt, Charleroi, Pa. U.S. Pat. 1,290,242, 7.1.19. Appl. 4.5.18.

AN oven is fixed over a fire-box, the flue from which communicates with an adjacent melting chamber. A tilting ladle is mounted in the melting chamber, and metal may be transferred from the oven to the ladle by means of a sliding spout.

—C. A. K.

Alloying furnace. F. L. McGahan, Los Angeles, Cal. U.S. Pat. 1,290,268, 7.1.19. Appl. 21.4.17.

Two adjacent smelting chambers are separated by a partition in the form of a hood with oppositely inclined faces. One is fitted with a number of fuel injectors and the second with carbon electrodes. Above the smelting chambers, and separated from them by water-cooled gates, are roasting compartments, separated from each other by water-cooled "grate-tubes." The roasting chambers communicate with a condenser and a vacuum draught stack.

—C. A. K.

Copper-coated printing rollers. Taylor, Garnett, Evans and Co., Ltd., and W. W. Bassham, Manchester. Eng. Pat. 122,433, 20.12.17. (Appl. 18,879/17.)

To efface the design from copper-coated printing rollers the cavities in the latter are filled with a non-electrolytic substance and the roller is then made the anode in an electrolytic bath. The rollers are first coated with the non-electrolytic substance and the raised parts are then exposed by removing the coating from these parts by a "doctor." The cathode of the bath is a similar roller which requires a further deposit of copper, and means are provided, for instance an abrading and burnishing device, for ensuring a uniform deposit over the whole surface.—T. St.

Zinc dust; Increasing the production of — from spelter retorts. C. W. and C. Crocker, Irvine. Eng. Pat. 122,566, 26.1.18. (Appl. 7025/18.)

A SET of baffles, not in alignment, mounted on a frame is inserted in the prolong used in connection with a zinc distillation retort, to facilitate the deposition of zinc dust. A removable nozzle is

fitted to the exit of the prolong to act as a burner and to form a receptacle for any zinc oxide formed. A guard at the inner end of the burner prevents this oxide from passing into the prolong, and means are also provided for preventing zinc oxide formed at the mouth of the condenser from passing into the prolong. An air-cooling device, which extends over part of the prolong, consists of a jacket, perforated on its underside, and bulged out and tapered on its upper side, with an air-exit at the apex of the tapered part. A "spoon" for use with sealed condenser pipes consists of a cylindrical portion which fits into the prolong, and an inner reduced tubular portion which passes through the sealing material into the condenser. There is a small hole in the inner end of the spoon to enable fumes etc. to pass from the sealed condenser to the prolong.—T. St.

Zinc; Metallurgy of —. J. Armstrong, London. Eng. Pat. 122,688, 28.1.18. (Appl. 1603/18.)

OXIDISED zinc ore is comminuted with bituminous coal, the mixture subjected to a low temperature coking process out of contact with air, and the resulting mass crushed and charged continuously into vertical tubular retorts formed in three sections, the middle one of which is heated and constitutes the reduction retort. This section is made of pure silica or corundum. The upper and lower sections are enclosed in the brickwork of the furnace, as are also the extremities of the middle section. Means are provided for introducing the charge and withdrawing the residue without admittance of air. A branch pipe opening into the upper section serves for the passage of the evolved metallic vapours to the condenser, which may consist of a tank of molten zinc protected from the atmosphere by a floating hood.—T. St.

Composite ingot; Welding of different metals to form a —. A. G. C. Pittevil, London. Eng. Pats. 122,231 and 122,365, 9.1.18. (Appls. 526/18 and 12,583/18.)

(A) In welding other metals (copper, brass, silver) to a steel or iron ingot, relative displacement of the metals is prevented by providing flanges or depressions on the surface of the ingot and by enclosing the composite ingot in a thin metal covering during manipulation, heating, and the first passage through the rolling mill. The covering is then removed and the rolling completed. The composite ingot is preferably heated in a closed receptacle, the cover of which rests on the ingot. To prevent welding of the metal covering to the ingot the latter may be coated with a mixture of calcium phosphate, phosphoric acid, and oil of turpentine. (B) A thin sheet of copper or other metal which will combine with a constituent of the metals to be welded, or of a fusible metal, such as tin, is interposed between the faces of the metals. The compound ingot is then heated and pressed. If the metal to be welded to the iron or steel is of considerable thickness, it is advantageous to divide it into sections and to interpose a thin sheet of the same metal between successive sections.—C. A. K.

Welded joints. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 122,604, 19.9.18. (Appl. 15,250/18.)

THE edge of one of two plates which are to be welded together is shaped to make a flange, preferably at an angle of about 40° to 50° with the surface of the plate. The second plate is then placed adjacent to the flange and the intervening wedge-shaped space is filled in with molten welding metal, which is welded to each of the plates.

—T. St.

Tinned scrap; Treatment of — H. Rogers, M. L. Lancaster, C. M. Walter, and J. Jackson, Birmingham. Eng. Pat. 122,618, 10.1.18. (Appl. 21,520/18.)

IN the electrolytic recovery of tin from tinned scrap, the latter is treated in a rotary container bodily removable from the vat, and the electrolyte, which is heated to about 180° F. (82° C.), is composed of a 1% solution of stannous chloride in a 7–10% solution of sodium or potassium hydroxide. After the detinning operation, the container is transferred to a recovery tank containing steam-heated water to recover the salts remaining on the scrap.—T. St.

Hardening and tempering wire. Critchley, Sharp, and Tetlow, Ltd., and H. Hepworth, Cleckheaton. Eng. Pat. 122,743, 23.3.18. (Appl. 5179/18.)

IN the process of tempering wire by means of gas flames, the wire is first drawn through a gas flame and quenched in an oil bath, and is then drawn over, but at a greater distance from, the same flame, and tempered in the same oil bath. Less gas is consumed than in the normal process of using molten lead for the second heating and separate oil baths.—C. A. K.

Lead bullion; Process of treating — G. P. Hulst, Hammond, Ind. U.S. Pat. 1,285,714, 26.11.18. Appl., 20.3.18.

LEAD bullion is liquated and the copper dross removed. The metal is then subjected to oxidising agents to separate other impurities, in the form of a lead-antimony slag, desilverised by means of zinc, again subjected to oxidising agents to form a "refiner skim," the refined lead moulded whilst hot, and then treated to remove any remaining copper in the form of dross. The "refiner skim" and "moulding skim" are added to the charge during the first oxidising treatment, and the "zinc skim" from the desilverised bullion is retorted, the retort bullion cupelled, the yellow litharge from the cupels reduced, and the resulting high-grade bullion added to the main charge of retort bullion in the cupels.

—C. A. K.

Magnetic ore; Apparatus for treatment of — E. W. Davis, Minneapolis, Minn. U.S. Pat. 1,286,247, 3.12.18. Appl., 18.5.16. Renewed 5.5.17.

THE apparatus comprises a spout, through which the coarse and fine ore is delivered into a classifier; the spout is surrounded by a tapered demagnetising alternating current coil. The overflow from the classifier passes through a launder surrounded by a tapered re-magnetising direct-current coil.

—W. R. S.

[Molybdenum] ores; Process of treating — A. L. Pellegrin, Tucson, Ariz. U.S. Pat. 1,286,400, 3.12.18. Appl., 2.1.17.

REFRACTORY oxide ores containing molybdenum, vanadium, uranium, etc., are crushed to –150 mesh and mixed with strong sulphuric acid so as to cause a rise in temperature without reduction of the acid oxide. The acid solution is separated from the insoluble portion, neutralised, and the molybdenum precipitated as sulphide.—W. R. S.

[Copper] ores; Process of treating ores — by flotation; Process of treating copper ores by flotation and sulphitisation. N. C. Christensen, Assignor to Metallurgical Improvement Corporation, Salt Lake City, Utah. U.S. Pats. (A) 1,286,531 and (B) 1,286,532, 3.12.18. Appl., 6.3 and 3.4.18.

(A) THE ground ore is agitated with a solution of sulphur dioxide; the liquor is treated with a soluble lime compound and heated, whereby cupro-cupric

sulphite is formed. The latter is separated by flotation. (B) A thick aqueous pulp of the ore is treated with sulphur dioxide in presence of an excess of metallic copper at the temperature of boiling water. The cupro-cupric sulphite formed and the excess of copper are removed by flotation.

—W. R. S.

Copper; Process for recovering — from ores and ore-products. G. N. Kirsebom, Copenhagen. U.S. Pat. 1,286,652, 3.12.18. Appl., 5.12.17.

SULPHIDE ores rich in copper, roasted silicious sulphide copper ores, and a quantity of coke sufficient to reduce ferric to ferrous oxide, are smelted together in an electric resistance furnace.

—W. R. S.

Clayey ores; Apparatus for clearing — E. F. Goltra, T. S. Maffitt, and J. D. Dana, St. Louis, Mo., and R. W. Erwin, Waukon, Iowa, Assignors to Mississippi Valley Iron Co., Wilmington, Del. U.S. Pat. 1,288,404, 17.12.18. Appl., 5.1.14.

THE material is heated and tumbled in a "converter" operated with or without a blast, and is then crushed and screened; the over-size is subjected to similar treatment in a second converter operated with a strong blast to remove the gangue.

—W. E. F. P.

Metallurgical process. Process of producing ferromanganese. J. T. Jones, Assignor to T. J. Howells, Pittsburgh, Pa. U.S. Pats. (A) 1,288,422, 17.12.18, and (B) 1,289,799, 31.12.18. Appl., 13.12 and 12.10.17.

(A) FINELY divided ore containing iron and manganese is mixed with finely divided coal, and the mixture is heated to 2000° F. (about 1090° C.), out of contact with air. After separating the metallic iron from the coked product, the residue is heated to 3000° F. (about 1650° C.), in the presence of air, to produce metallic manganese. (B) The metals produced as above are melted together to form ferromanganese.—W. E. F. P.

Metal [aluminium]; Process of printing on — P. MacGahan, Pittsburgh, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,289,215, 31.12.18. Appl., 29.12.14.

A SMOOTH and even coating of aluminium oxide is produced on sheet aluminium by immersing the metal in a solution of a soluble silicate through which an electric current is passed. The metal is then dried and printed upon, as for example in the manufacture of dials for clocks.—W. E. F. P.

Ore-reducing furnace and process. Metallising process and apparatus. Ore-reducing apparatus and process. (A) J. T. Jones, (B) (C) J. M. Longyear and J. T. Jones, Marquette, Mich., Assignors to New Metals-Process Co., Chicago, Ill. U.S. Pats. (A) 1,289,800, (B) 1,289,834, and (C) 1,289,835, 31.12.18. Appl., 23.2.15. Renewed 2.11.18.

(A) THE shaft of a vertical furnace is shaped so as to provide a tortuous (zigzag) path for a stack of solid fuel and ore, and to afford supports at intervals, dividing the stack into separate portions, to each of which air is supplied (through tuyères at one side) in such limited quantity as to maintain a deoxidising atmosphere throughout the shaft. (B) The shaft of the furnace is constricted at regular intervals to form a series of superposed sections, each having tuyères at the lower part. Air is supplied to these sections in such manner as to maintain deoxidising conditions throughout the lower part of the stack, to provide a high-temperature zone near the bottom, and to preheat the solid fuel in

the upper part. (c) In a furnace of the type described under (b), adjustable, horizontal supports for the different burden sections are provided at the constricted portions of the shaft.—W. E. F. P.

Flotation process. R. Gahl, Miami, Ariz., Assignor to The Utah Copper Co. U.S. Pat. 1,290,166, 7.1.19. Appl., 31.1.16.

ORE is mixed with a solid material, *e.g.*, sub-divided metallic iron, capable of increasing the efficiency of flotation. The added material is subsequently recovered from the flotation tailings and used with a further supply of ore.—C. A. K.

Metallic dust; Manufacture of —. E. J. Hall, Assignor to Metals Disintegrating Co., New York. U.S. Pat. 1,290,181, 7.1.19. Appl., 4.5.17.

A SMALL quantity of a metal with a greater affinity for oxygen than the metal under treatment is added to the bulk of molten metal before disintegration. Substantially pure metal dust free from oxide may then be obtained by atomising the molten mixture without complete exclusion of oxygen.—C. A. K.

Nickel copper mattes; Method of separating nickel from —. E. C. R. Marks, London. From United States Nickel Co., New York. Eng. Pat. 122,335, 11.4.18. (Appl. 6193/18.)

SEE U.S. Pat. 1,273,465 of 1918; this J., 1918, 591 A.

Kilns. Eng. Pat. 122,742. See I.

XI.—ELECTRO-CHEMISTRY.

Paper; Change of specific inductive capacity with temperature and impregnation in —. H. C. P. Weber and T. C. MacKay. J. Franklin Inst., 1918, 186, 374—377.

THE measurements were made by the simple bridge method in which two arms are resistances and the other two capacities. The resistances were each 9000 ohms, one capacity was a calibrated air condenser, and the other a pair of massive iron electrodes kept at a definite separation by glass stops and between which was placed the sample under examination. The temperatures taken were those of the iron electrodes. Curves of the changes in specific inductive capacity with temperature are given for paper impregnated with ceresin, paraffin, Carnauba wax, montan wax, and ammonium stearate respectively, and for the same substances alone. In each case the specific inductive capacity of the pure substance was lower and less affected by temperature change than that of paper impregnated with the substance.—B. V. S.

Electrical precipitators. Thum. See I.

Electric heating in concentration of sulphuric acid. Pagliani. See VII.

Porcelain. Bleininger. See VIII.

PATENTS.

Electrodes of electric batteries. M. Robin, Buenos Ayres, Argentine. Eng. Pat. 122,697, 30.1.18. (Appl. 1765/18.)

A BATTERY electrode comprises a zinc base, coated with a mixture of grease, insoluble in the electrolyte, and a ferrocyanide. Alternatively an amalgamated zinc plate coated in the above manner is used

as the negative electrode in a battery, which is then charged and discharged to the normal coefficient, and afterwards charged to a very high coefficient; the coating is then removed from the zinc electrode and compressed. The electrode thus formed retains its charge on "open circuit," and may be withdrawn from the electrolyte without discharge and disintegration.—B. N.

Battery electrode. W. O. Snelling, Pittsburgh, Pa. U.S. Pat. 1,288,722, 24.12.18. Appl., 24.4.15.

AN electrode for primary galvanic cells is formed from a mixture of granular carbon, granular manganese dioxide, and up to 1% of finely divided nickel.—D. F. T.

Electric safety-fuse. W. O. Snelling, Pittsburgh, Pa. U.S. Pat. 1,288,724, 24.12.18. Appl., 22.3.15. Renewed 8.6.18.

AN electric safety-fuse comprises a body of readily fusible conducting material associated with a solid ethane polyhalide capable of volatilisation into a fire-preventing vapour.—D. F. T.

Electrical separation of suspended particles. Eng. Pat. 122,534. See I.

Treating [petroleum] oil. U.S. Pat. 1,290,369. See IIA.

Production of nitrides. Eng. Pat. 122,523. See VII.

XII.—FATS; OILS; WAXES.

Cotton seed; Removal of the residual fibres from — and their value for non-textile purposes. E. C. de Segundo. J. Roy. Soc. Arts, 1919, 67, 184—188. (See this J., 1918, 118 r, 172 r.)

IN the treatment of a woolly cotton seed retaining 10—12% of fibre, the first process after ginning is the "linting" process with saw-linting machines. The quantity of fibre removed as "linters" may be varied, partly voluntarily, by the adjustment of the saws, and partly involuntarily, by the wearing down of the cutting edges. If the latter are sharpened at very frequent intervals, the removal of the linters may be maintained at the maximum percentage, but their total commercial value for textile purposes is not increased by increasing the quantity, since their quality decreases in the same ratio. Nevertheless, since the war, the demand for linters for explosives manufacture has been so keen that the quantity removed in this process shows a progressive increase. The author points out that the legitimate function of the saw-linting machine is to skim off the inferior textile fibre left by the gin and that if it is used for removing the non-textile fibre also, its productive and mechanical efficiency falls rapidly and the textile linters are contaminated with the non-textile, as well as with an abnormal amount of hull debris. The author has devised a seed-defibrating machine for removing as much of the non-textile lint as is desired in a separate process, following the removal of the textile linters by the saw-linting machine. He proposes the following distribution of the different fractions of fibre obtainable from American Upland cotton retaining 11% of total fibre: High grade (textile) linters by the saw-linting machine, 2%; seed-lint (non-textile) by the seed-defibrator, 3%; and hull-fibre, after decortication and screening, 6%. Egyptian and Bombay seeds would have to be crushed by the British system, because they do not retain sufficient fibre after ginning to carry them through the decorticating process, but the seed-

defibrator would still be applicable to these varieties for the removal of the 1.5–2% of lint which now finds its way into the cake. Certain considerable advantages as regards storage, transport, and the selection of germinable seeds are to be obtained by defibrating the seeds in the country of origin, and if this operation could be established in India, the seeds exported would command a premium of 12s.–25s. per ton on the British market.—J. F. B.

Oils; Study of the viscosity of various colonial —. F. Helm. Bull. de l'Office Colonial, 1918, 11, 251–264. Bull. Agric. Intell., 1918, 9, 1367–1368.

THE viscosity of an oil or fat increases with the m.pt. of the fatty acids, except in the case of very viscous oils. It also increases with the sp. gr. of oils arranged in the three groups—drying, semi-drying, and non-drying oils. It varies inversely with the iodine value.—C. A. M.

Soaps containing clay; Determination of fatty soap in —. F. Bodinus. Z. Unters. Nahr. Genussm., 1918, 36, 190–191.

To determine the total amount of fatty soap in soaps containing clay, 5 grms. of the finely divided sample is mixed with 50 grms. of sand and extracted with hot methyl alcohol; the alcoholic extract is evaporated, and the residue of soap contained therein is dried and weighed. This residue may be dissolved in water and the fatty acids liberated and determined in the usual way.—W. P. S.

Oil of turpentine and rosin. Besemfelder. See XIII.

Sorghum fat. Francis and Friedemann. See XIXa.

Utilising animal carcasses. Frabot. See XIXa.

Fat extraction apparatus. Griffiths-Jones. See XXIII.

PATENTS.

Solid and liquid fatty or fat-like bodies; Separating —. F. Pink, Portsmouth. Eng. Pat. 122,764, 16.5.18. (Appl. 8209/18.)

THE fatty matter is charged into a long tube or bag, and is pressed by drawing the bag through a draw-through aperture or against scraping edges, or between internally heated or cooled rollers with an adjustable nip. Fractionation of the fatty material may be obtained by employing several dies or draw apertures maintained at any desired temperature or housed in air at any desired temperature. The fatty material may be fed into the tube or bag by a driving spiral or packing mill.—A. de W.

Fatty materials; Process of treating solid —. W. P. Schuck, Assignor to Superior Oil and Process Co., Portland, Oreg. U.S. Pat. 1,288,228, 17.12.18. Appl., 9.1.17.

FATS, such as coconut oil, consisting of a mixture of normally solid and normally fluid constituents, are treated with a small amount (5%) of hollow fibres, such as flax, and made into cakes. These are wrapped in filter-cloths and expressed at a temperature only slightly below the m.pt. of the solid fat. A large proportion of the liquid constituent can thus be expelled, and the residual cakes are then melted, and the fibres separated.—C. A. M.

Soap; Process of making —. L. Stastney, Chicago, Ill. U.S. Pat. 1,288,255, 17.12.18. Appl., 27.5.18.

THE heated soap mass is introduced into a closed mould, where it is compressed and left to cool while compressed.—C. A. M.

Oil composition and process of making same. R. Boehringer, Newark, N.J. U.S. Pat. 1,289,097, 31.12.18. Appl., 1.6.16.

A COMPOSITION soluble in water is obtained by dissolving a resin in animal or vegetable fats or fatty acids, treating the solution with sulphuric acid, and neutralising the sulphonated product with an alkali.—C. A. M.

Linseed oil fatty acids. Eng. Pat. 112,696. See XIII.

Utilising animal carcasses. Ger. Pat. 308,753. See XV.

Cocoa butter. Eng. Pat. 122,512. See XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Oil of turpentine and rosin; German —. E. R. Besemfelder. Chem.-Zeit., 1919, 43, 4–5.

ALL soft woods and many coniferous woods can be advantageously dried by the method previously described (this J., 1917, 148). Apparatus has also been constructed in which sawdust is introduced pneumatically at one end, freed from rosin, and withdrawn dry and sterile at the other ready for mixing with molasses for fodder. The dissolved lignin substance is evaporated, dried and distilled and the residue ignited to recover the alkali salts. It is suggested that no wood should be burned without previous extraction of fat and rosin. From one-third to one-quarter of the extract of wood, calculated on the dry substance, consists of fatty acids. Since the amount of oil of turpentine and the solubility of the rosin rapidly decrease, it is advisable that the wood should be extracted on the spot and as soon after felling as possible. The drying can be effected by means of a solvent of such low b.pt. that the sap can be expelled from fresh wood without coagulating the albuminous constituents. The process renders fir wood immediately available for the manufacture of cellulose, whereas under ordinary conditions storage for about 6 years is required to render the fat and rosin innocuous.—C. A. M.

Rosin; [Determination of] melting point of —. T. L. Crossley. J. Ind. Eng. Chem., 1919, 11, 52–53.

ROSIN has no definite melting point, and any specification aiming to grade it by reference to its behaviour when heated should state the method used. If the m.pt. is determined by dipping glass tubes into the molten substance so that a definite depth of substance remains in the tube on cooling, then dipping these tubes 1 in. below the surface of water, raising the temperature of the latter, and noting the point at which the water penetrates the layer of rosin, the results obtained are not very definite. The result is merely the point at which the viscosity of the rosin is so reduced that it is overcome by the pressure of 1 in. of water. The greater the thickness of the column of rosin, the higher is the m.pt. observed. Results from 10° to 20° C.

lower are obtained if a mere film of rosin is formed on the end of the tube and these results agree closely with those found by the capillary tube method in which the powdered rosin is heated in a capillary and the temperature noted at which the particles coalesce; the heating should not be continued until the whole of the rosin becomes clear.

—W. P. S.

Resins; Constituents of —. III. *Siaresinol from Stamese gum benzoin*. A. Zinke and H. Lieb. Monatsh. Chem., 1918, 39, 627–639.

FURTHER examination of *d*-sumaresinol and siarcsinol (this J., 1918, 520 A, 663 A) has shown that these isomeric substances are acidic in character and that the acidic hydrogen is contained in a carboxyl- and not in a hydroxyl-group as assumed by Lüdy (this J., 1893, 946; 1894, 821); the former is therefore to be regarded as *d*-sumaresinolic acid and the latter as *d*-siaresinolic acid. Oxidation of *d*-siaresinolic acid leads to the formation of a monobasic acid, $C_{27}H_{40}O_6$, and the loss of three atoms of carbon and eight atoms of hydrogen appears to denote the elimination of a propyl or isopropyl group: the formula for the mother-substance may be written, $C_{26}H_{40}O_2.C_3H_7.CO_2H$. Chromic acid oxidises the double compound of acetic and *d*-siaresinolic acid (this J., 1918, 520 A) to an acid, $C_{27}H_{40}O_6$, short prisms, m.pt. $317^\circ C.$, $[\alpha]_D^{25} = -193.8^\circ$ in chloroform solution.—H. W.

PATENTS.

[*Colour*] lakes; *Manufacture of* —. E. F. Morris, Liverpool. Eng. Pat. 122,540, 12.3.18. (Appl. 4289/18.)

NEUTRAL lakes are obtained by absorbing acid dyes under acid conditions with aluminium hydroxide, alone or with substrata such as barium sulphate. The absorbed acid dye is then treated with a neutral solution of a salt of the same or another dyestuff. A further treatment of such lakes with soluble barium or calcium salts varies the shades obtained.

—A. de W.

Oil-pastes; Conversion of water-pastes into — by chemical and mechanical action. H. P. Fletcher, Sydney, N.S.W. Eng. Pat. 122,612, 26.10.18. (Appl. 17,493/18.) Int. Conv., 15.8.18.

THE formation of oil paste, e.g., white lead paste, from a water paste, without previous drying, is accomplished by milling the water paste with a predetermined quantity of manganese borate, the necessary oil being then added and milling continued until the water separates. The amount of manganese borate necessary varies with the water content of the paste but should never exceed 0.5% of the wet paste.—A. de W.

Anti-fouling paints; Manufacture of —. W. Bailey, London. Eng. Pat. 122,683, 8.7.18. (Appl. 1372/18.)

AN anti-fouling paint which remains in permanent suspension and has no softening effect on the anti-corrosive undercoat is obtained by mixing together a liquid vehicle and a powder base separately prepared. The vehicle is prepared by melting 5 parts by weight of rosin at $165^\circ C.$ and adding it in the molten condition to 6 parts by weight of white spirit (petroleum). The powder base consists of a mixture of zinc oxide 20 parts, powdered whiting 30 parts, red iron oxide 65 parts, barytes 100 parts, cuprous oxide 22 parts, yellow mercury oxide 15 parts, and copper thiocyanate 15 parts; 7 parts of silica may also be added. The paint is prepared by mixing the powder as above with (say) 150 parts of the liquid vehicle together with (say) 45 parts of rosin oil, grinding in a paint mill, and thinning with more of the liquid vehicle.—A. de W.

Titanic oxide product [pigment]; Composite — and method of producing same. L. E. Barton, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,288,473, 24.12.18. Appl., 11.8.17.

A SOLUTION of titanium sulphate or other titanium compound is mixed with an "extender-pigment," and treated with a reagent to produce the required amount of an insoluble sulphate. A titanic compound is then precipitated in the mixture, and the resulting coalescing mass of "extender-pigment," sulphate base and titanium compound is separated and calcined.—C. A. M.

Pigments; Manufacture of —. F. Steinitzer, Fürstentfeldbruck. Ger. Pat. 305,774, 4.1.17.

TALC as free as possible from clay is treated with acid, neutral, or basic solutions of metallic salts and then with solutions of other suitable salts to form coloured products or with solutions of lake-forming organic colouring matters. The products when made into paints dry better and are superior in other respects to those obtained by using clay or talc admixed with clay.

Linseed oil residual fatty acids; Process for treating — and utilising the same as oil or for paint or for oxidation for the manufacture of linoleum and like products. E. C. Witter, Appleby Bridge, Lancs. Eng. Pat. 122,696. (Appls. 1750, 30.1.18, and 10,424, 25.6.18.)

RESIDUAL linseed oil fatty acids are converted into a paint oil by heating to 500° – $600^\circ F.$ (260° – $315.5^\circ C.$) for about four hours or upwards, with or without the addition of driers. For use in linoleum manufacture the product described above is further treated by a known process of oxidation (Eng. Pats. 12,000 of 1890 or 7126 of 1894; this J., 1891, 713; 1895, 372) or preferably by steam-heating to 150° – $180^\circ F.$ (64.5° – $82^\circ C.$) with a mixture of about 5% of drier (lead and/or manganese resinate or cobalt base) and 5–10% of whitening or finely-divided earth colour whilst subjecting to a current of air and agitation for about 24 hours. When stiffening takes place, suitable gums and/or resins are added and heating and agitation continued until the desired consistency is obtained.—A. de W.

Resinous product; Manufacture of a —. E. Zimmermann, Elberfeld. Ger. Pat. 305,775, 13.2.17.

LACTIC acid is heated *in vacuo* for a long time, the temperature being raised gradually from 100° to $200^\circ C.$, and the product is condensed with formaldehyde or paraldehyde. An odourless, non-inflammable resinous product, soluble in chloroform and glacial acetic acid, slightly soluble in benzene, insoluble in ether, alcohol, and petroleum spirit, is thus obtained. Its colour varies from pale yellow to almost black, according to the purity of the lactic acid used.

Pipe-caulking composition. R. B. Howell, Omaha, Nebr. U.S. Pat. 1,290,204, 7.1.19. Appl., 19.5.17.

A PIPE-JOINTING composition is obtained by melting together sulphur (46 parts), sand (46), and carbon (8 parts).—A. de W.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

[*Rubber*] latex; *Bacterial changes in* —. G. S. Whitby. Agric. Bull., Fed. Malay States, 1918, 6, 513–516.

THE conclusions drawn by Kendall (J. Biol. Chem., 1913, 13, 63; J. Amer. Chem. Soc., 1913, 35, 1201) to the effect that bacteria which can utilise both carbohydrate and protein, preferentially act on the

former, explain the influence of the addition of sugars in preventing the putrefactive decomposition of the nitrogenous constituents of latex and in increasing the degree of acidity produced; it is not necessary to assume the existence of two distinct sets of bacteria, one capable of attacking carbohydrates and at the same time unfavourable to the growth of the other which is capable of causing the decomposition of the nitrogenous compounds. The anti-coagulative effect of the putrefactive or proteolytic activity in latex is probably due only in part to the production of alkaline substances.—D. F. T.

Rubber; Moisture-content of plantation — O. de Vries. Comm. Central Rubber Stat., Buitenzorg, Java, 1918, No. 12, 852–860.

THE average moisture content (loss in weight at 95° C.) of crêpe rubber is rather higher during the wet monsoon than during the dry monsoon, but with smoked sheet the reverse is the case; this conclusion is based on results obtained with a total of 261 samples. Even with samples of the same type the moisture content may vary considerably owing to variation in the hygroscopic state of the atmosphere and to differences in the proportion and nature of the non-caoutchouc constituents of the rubber. Processes causing loss of serum substances, e.g., dilution of the latex, keeping freshly rolled crêpe or sheet under water, or allowing a day to elapse before rolling the coagulum, tend to give drier rubbers. The use of formalin has no effect on the final proportion of moisture retained by the rubber, but sodium bisulphite or sodium carbonate may cause a higher moisture content; smoking the rubber sheet introduces a further complication and in cases where the smoking caused an increase in weight of 1 to 2%, a slight increase was also observed in the moisture content.—D. F. T.

Rubber-sulphur mixtures; Tensile strength of — O. de Vries and H. J. Heilendoorn. Comm. Central Rubber Stat., Buitenzorg, Java, 1918, No. 11, 769–791.

ON vulcanising a mixture of rubber 92½% and sulphur 7½% for a series of increasing periods, a gradual increment is at first observed in the tensile strength of the product until a maximum is attained, after which the tensile strength decreases rapidly; the resistance to stretching, however, continues steadily to increase so that the end-points of the stress-strain curves for the various periods of vulcanisation form a rough parabola. With mixtures containing higher percentages of sulphur a similar phenomenon is observed, but with a lower proportion, e.g., 5%, although the tensile strength reaches a maximum when the proportion of combined sulphur is approximately 4½%, further "vulcanisation" causes an increase in the extensibility so that the stress-strain curve no longer descends steadily but begins to recede; it is, therefore, possible with such low proportions of sulphur to vulcanise the mixing for two periods, one on each side of the period for maximum tensile strength, and to obtain products of different free sulphur content but giving coincident stress-strain curves. This possibility demonstrates the advisability, in rubber testing, of using a standard mixing with a relatively high content of sulphur, e.g., 7½ or 10%. —D. F. T.

Rubber stress-strain curve. P. Schildrowitz and H. A. Goldsbrough. India-Rubber J., 1919, 87, 269–270.

THE results of experiments are quoted in agreement with the observation of other workers that when a rubber mixing free from inorganic and organic

accelerators and containing a comparatively small proportion of sulphur is vulcanised for such a period that the free sulphur has almost entirely disappeared, further heating may cause the rubber to become more extensible, so that the stress-strain curve undergoes "reversion" or begins to assume a steeper initial course, although the alteration is small compared with the opposite effect of the earlier stages of vulcanisation. This phenomenon is in accord with the view that during vulcanisation two changes occur concurrently: (1) a process of integration or "firming up" accompanied by chemical combination with sulphur, and (2) a degradation process due to the action of heat only. In the presence of accelerators the "reversion" appears to be more rapid and may be accompanied by alteration in the "type," viz., an increase in the slope of the curve, which indeed may finally become convex towards the load axis. The phenomenon of reversion is indicated as the main cause of the difference between the physical character of reclaimed rubber and of the waste vulcanised rubber from which it is made. (See De Vries, preceding abstract.) —D. F. T.

Caoutchouc; Synthetic — C. Duisberg. Z. Elektrochem., 1918, 24, 369–372.

SYNTHETIC rubber from dimethylbutadiene (methylisoprene) as first made on a commercial scale was very susceptible to oxidation and combined very slowly with sulphur. These difficulties were overcome by the addition of organic bases (especially piperidine and similar substances) and in this way hard rubber (vulcanite) equal in strength to that made from natural rubber and with an electrical resistance about 20% higher has been made. The production of soft vulcanised rubber from the synthetic product has not been equally successful. Leather-like products are usually obtained and although the elasticity can be improved by addition of dimethylaniline and other substances, the material does not work well on the rolls, does not vulcanise satisfactorily, and is inferior in "nerve" to vulcanised rubber made from the natural product.—J. F. S.

Permeability of balloon fabrics. Edwards. See V.

PATENTS.

Rubber derivatives; Manufacture of — W. O. Snelling, Pittsburgh, Pa. U.S. Pat. 1,288,723, 24.12.18. Appl., 15.11.15.

A PLASTIC oxidation product of rubber is obtained by treating natural rubber with an oxidising agent such as ozone in the presence of water and a small quantity of copper oleate.—D. F. T.

Rubber goods; Process and apparatus for vulcanising — A. L. Comstock, Boston, Mass., Assignor to American Rubber Co. U.S. Pat. 1,289,043, 24.12.18. Appl., 16.5.13.

VULCANISATION is effected by removing the atmosphere surrounding the goods and subjecting them to an atmosphere of inert gas which is maintained at the required temperature. The gas is heated outside the vulcanising chamber and is made to circulate by means of a pump. The articles to be vulcanised are placed on forms, introduced into the heated vulcanising chamber which is then closed, and the internal pressure is reduced; on again raising the pressure, the articles become compacted and firmly adherent to the forms, and whilst the pressure is maintained the interior of the chamber is heated, vulcanisation being thereby effected. —D. F. T.

Vulcanising; Method of — J. R. Gammeter, Akron, Ohio, Assignor to B. F. Goodrich Co., New York. U.S. Pat. 1,290,731, 7.1.19. Appl., 18.4.17.

RUBBER articles are vulcanised by intermittently pressing and continuously heating a series of moulds containing them, in a succession of overlapped curing periods, and replacing with fresh moulds those of the series the curing period of which is complete, during the intervals of release of pressure.—E. W. L.

Rubber or like substance; Process of synthetically producing — L. Gottschalk, Metuchen, N.J. U.S. Pat. 1,289,444, 31.12.18. Appl., 14.5.15.

COMMERCIAL turpentine, from which the resin has been removed, is heated together with an acid to a temperature not exceeding 240° C., and the resulting mixed vapours are passed through a tube the first portion of which is at 250° C. and the further portion at 300° C. or higher. At the former temperature the pinene undergoes conversion into limonene which at the latter temperature changes, at least in part, into a rubber-like substance. The vapours are then condensed, and after removal of the acid, by-products are separated by distillation from the resulting material, and the residual rubber-like material is dried in the air at a temperature not exceeding 85° C. The by-product and the recovered acid are used again in the process.—D. F. T.

Caoutchouc-like substances; Process for improving — Badische Anilin u. Soda Fabrik. Ger. Pat. 307,341, 13.10.16.

THE caoutchouc-like substances obtained by treating butadiene or its homologues with metals such as sodium, in presence of carbon dioxide (see Fr. Pat. 459,095; this J., 1913, 1164) do not yield satisfactory products on vulcanisation. Good results are obtained, however, if the substances before vulcanisation are subjected to mild oxidation, corresponding to an absorption of 3–4% or even 6% of oxygen. For example, the product obtained from isoprene by the action of sodium in presence of carbon dioxide, after being washed with water, is spread out whilst still moist and exposed to the air. After three days, when about 3% of oxygen has been absorbed, the sticky mass is worked on the rolls, mixed with sulphur etc., and vulcanised.

Recovering solvents. Eng. Pat. 122,685. See V.

XV.—LEATHER; BONE; HORN; GLUE.

Utilising animal carcasses. Frabot. See XIXA.

PATENTS.

Bates for hides; Method of preparing — L. R. Peyrache, Paris, and O. V. Bailly, Saint-Mandé, France. Eng. Pat. 120,928, 22.11.18. (Appl. 19,238/18.) Int. Conv., 22.11.17.

A BATE for the treatment of hides consists of an opoherapeutic pancreatic or pancreo-intestinal powder prepared from fresh pancreatic glands and the fresh mucus of the small intestines, and contains in addition to their water-soluble principles the whole of the soluble and insoluble enzymes of these glands and mucus. It may be prepared (1) by mixing the finely triturated pulp of 87 kilos. of fresh ovine, equine, porcine, or bovine pancreas with 250–300 litres of acetone, filtering after a few minutes, pressing the residue, treating it with two further quantities of 1½–2½ times its own volume of anhydrous acetone, and finally allowing the last traces of acetone to evaporate from the mass and reducing it to the finest possible powder; or (2) by

treating 32 kilos. of fresh intestinal mucus with 100–120 litres of acetone in a similar manner. The products are perfectly stable for several months, and may be used, preferably at 30°–40° C., alone or in conjunction with neutral or faintly alkaline or acid deliming agents, and in presence of inert substances such as cellulose.—E. W. L.

Tanning. E. Schwarz, Berlin, and L. Blangey, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,289,280, 31.12.18. Appl., 27.4.17.

HIDES are tanned in a bath containing a carbazole-sulphonic acid.—C. A. M.

Tanning with the aid of sulphonated oils. O. Röhm, Darmstadt. Ger. Pat. 308,386, 16.2.16.

SULPHONATED oils from which the whole or a greater part of the soaps have been removed are dissolved in a volatile solvent, treated successively with flour and a solution of alum and salt, and then applied directly to hides. (See also Fr. Pat. 470,594 of 1914; this J., 1915, 190.)

Glue; Liquid — F. W. Channon, West Byfleet, Surrey. Eng. Pat. 122,807, 2.12.18. (Appl. 19,897/18.)

ORDINARY gluc, 18 lb., is soaked for 12 hrs. in soft water, 12 qts., then heated to 80° F. (27° C.) and stirred till fluid. The following mixture is then slowly added, at 60° F. (15.5° C.), whilst the liquid mass is stirred:—Ammonium carbonate, 1½ oz., in soft water (at 120° F.), 10; phosphoric acid, 20; absolute alcohol, 10; oil of lavender, 4; amyl acetate, 1; carbolic acid (pure), 40 oz. The whole is heated to 120° F. (49° C.) for 15 mins. and then allowed to cool. The glue remains liquid at 70° F. (21° C.), and is said to possess the power of penetrating wood.—E. W. L.

Animal carcasses; Apparatus for utilisation of — [for recovery of glue, fat, etc.] H. Goslar, Aachen. Ger. Pat. 308,753, 15.11.16. Addition to Ger. Pat. 308,152 (this J., 1919, 23 A).

A SYSTEM of heating tubes is arranged in the charging chamber, separated from the interior of the chamber by perforated angle-sheets. The arms of the stirrer, situated at the bottom of the charging chamber, work in contact with a perforated annular portion at the outer circumference of the floor of the chamber. Below the charging chamber there is arranged a rotating sieve table, provided with a scraper at its outer edge. The fleshy residues, sterilised and freed from fat, are thereby reduced to the form of a meal.—J. F. B.

Drying leather, etc. Eng. Pat. 122,544. See V.

XVI.—SOILS; FERTILISERS.

Soil; Flocculating power in — I. *Coagulating action of some soluble salts on clay in soil.* G. Masoni. II. *Determination of the flocculating power of soil solution.* G. Leoncini and G. Masoni. R. Univers. di Pisa. Istit. di Chim. Agr., Stud. e Ricerche, 1909–1914, Pt. 22, 247–293, 406–420, Bull. Agric. Intell., 1918, 9, 1285–1287.

I. THE flocculating power of the chlorides, nitrates, and sulphates of sodium, potassium, ammonium, and calcium was studied, using an ordinary soil not too rich in clay and poor in organic matter. The soil was first air-dried and then sifted to remove the fine particles. The results show that, weight for weight, chlorides have a greater flocculating

power than nitrates and these in turn than sulphates. Calcium salts have a greater flocculating power than potassium and ammonium salts, and the latter are more active than sodium salts. There is no ratio between the weight of salts used and their flocculating action. The flocculating power of each salt decreases with increase in the ionic concentration, but there is no simple relationship between the dissociation and the flocculating power of a salt. The flocculating action of the salts tested is due exclusively to the cations, the clay acting as a negative colloid. Concentration and dissociation being equal, salts with identical cations but different anions have the same flocculating power. The valency of the cation, but not the atomic weight of the element, has a relative influence on the flocculating power. Taking the flocculating power of the sodium ion as 1, the relative flocculating powers of the other cations studied are approximately: potassium 2.4, ammonium (NH₄) 2.4; calcium 5.7. The modifications in the permeability of the soil caused by saline solutions have no direct relation to the flocculating power of these solutions on clay, even in the case of very thick layers of soil and relatively concentrated solutions.

II. To measure the flocculating power of a soil solution, 0.5 gm. of very fine kaolin and 200 c.c. of the solution to be tested are placed in an Appiani levigator, and the whole is shaken for $\frac{1}{2}$ hour and left to stand 6 hours. The thick liquid is poured into a flask and the amount of kaolin in suspension is determined by the difference between the residue left by 100 c.c. of this liquid when evaporated to dryness at 105° C., and the residue left, under the same conditions, by 100 c.c. of the soil solution. The flocculating power Pf, as compared with distilled water, is given by $Pf = A/S$, where A is the weight of kaolin left in suspension in distilled water, and S the weight of kaolin left in suspension in the solution examined.—W. G.

Soils, muds, and farm manures; Biological absorption of methane and the distribution of Kaserer and Söhngen methane organisms in —. I. Giglioli and G. Masoni. R. Univers. di Pisa, Istit. di Chim. agr., Stud. e. Ricerche, 1909—1914, Pt. 22, 76—108, Bull. Agric. Intell., 1918, 9, 1288—1289.

The authors confirm the results of Kaserer and Söhngen that methane in the presence of oxygen is absorbed by soil bacteria. Its absorption and oxidation are purely biological phenomena, not influenced apparently by light, but favoured especially by temperatures about 30° C. Different varieties and species of methane bacteria seem to exist and to act at different temperatures. In ploughed field and meadow soil these organisms are rare and not very active on the surface, but are abundant and active in the lower layers. They are also present in large numbers in river mud, manure (especially rotted and moistened), liquid manure, and sewer contents. Thus manure well dug in should help to enrich the soil in micro-organisms which prevent the loss of methane by forming from it new organic matter.—W. G.

Sewage; Influence on the fertilising power of — of the bacteria it brings to the soil. G. Masoni. R. Univers. di Pisa, Istit. di Chim. agr. Stud. e. Ricerche, 1909—1914, Pt. 22, 295—327. Bull. Agric. Intell., 1918, 9, 1289—1290.

A COMPARISON of the influence of natural sewage and partly or completely sterilised sewage on ordinary soil and on soil sterilised by heating at 130°—140° C. for eight hours. The sewage was sterilised by boiling, by the addition of 1% by weight of sulphuric acid, or by the addition of an equivalent amount of sodium sulphate. In one series of experiments the

sewage was spread over the soil and in another mixed with it in pots, the effects being measured by the yields and conditions of the crops. With untreated soil, sterilised sewage gave much better results than natural sewage, the addition of sodium sulphate being the least satisfactory of the three methods of treatment. With sterilised soil the pots with natural sewage gave higher yields than the control pots or than the pots with sterilised sewage.—W. G.

Farm manure; Effect of — in stimulating the yields of irrigated field crops. C. S. Scofield. J. Agric. Res., 1918, 13, 493—503.

THE effect of farmyard manure, applied at the rate of 12 tons per acre once during the rotation, on the yields of Irish potatoes and sugar beets under irrigation has been tested for six years in seven different rotations, varying from two-course to six-course, at three stations in the northern Great Plains. In the case of potatoes the general effect was to increase the yield of potatoes by 20—40 bushels per acre, with an increase of up to 8% in the proportion of marketable potatoes. Similarly the yield of sugar beets was increased by 1.9—4.3 tons per acre without materially affecting the percentage of sugar in the beets. In five of the seven rotations the manure was applied to the crop which was weighed, and in the other two rotations it was applied for the preceding crop.—W. G.

Phosphatic fertilisers; Analysis of —. I. Adulteration of bone superphosphates. G. Masoni. II. Use of ammonium citrate in the determination of phosphoric acid. A. Quartaroli and A. Rogai. R. Univers. di Pisa, Istit. di Chim. agr., Stud. e. Ricerche, 1909—1914, Pt. 22, 139—170, 427—443. Bull. Agric. Intell., 1918, 9, 1291—1293.

I. WHERE adulteration of a bone superphosphate is suspected the following tests may be applied. A little of the substance is charred in a porcelain dish and then calcined in a platinum dish which is removed now and then from the flame. Pure bone superphosphate gives off no white fumes. After prolonged calcination, the still incandescent substance should not have a deep yellow colour, which subsequently disappears, but should remain white or at the most yellowish. The cold, calcined residue should remain white or have only a pale reddish tinge and should be completely soluble in warm 10% hydrochloric acid. Quantitative determinations should be made of the moisture content, total P₂O₅, water- and citrate-soluble P₂O₅, total SO₃, and residue insoluble in *aqua regia*. On calculating the results on a dry matter basis at 100° C., and taking $ST = 100 \times \text{total SO}_3 / \text{total P}_2\text{O}_5$ and $SS = 100 \times \text{total P}_2\text{O}_5 / \text{citrate-soluble P}_2\text{O}_5$; then in good bone superphosphate the values of ST and SS should not exceed 130 and the difference ST—SS should not be great. If the values of SS and ST fall much below 110, precipitated phosphates have probably been added. A value of 1.3 for the percentage of residue insoluble in *aqua regia* is high.

II. Comparing the ammonium citrate method with the molybdate method for the estimation of phosphoric acid in superphosphates and basic slag, the authors find that, in the case of basic slag, the citrate method may sometimes lead to serious errors. If the results disagree and the precipitates are not perfectly white and amorphous after calcination, it is possible, by estimating the iron, to determine whether errors are due to its presence. In such a case, preliminary elimination of the iron by means of "cupferron" might give reliable results. This method, however, is not generally applicable, in practice, to commercial analyses. In the cases where iron or aluminium phosphates are concerned the citrate method is not applicable.—W. G.

Greensand; Value of — as a source of potassium for plant culture. R. H. True and F. W. Gelse. J. Agric. Res., 1918, 15, 483–492.

THE greensands (mainly glauconite, with or without fossil shells) or greensand marls used in the experiment contained CaO 0.33–12.50%; P₂O₅ 0.16–1.25%; SO₃ 0.0–0.50%; total K₂O, 1.52–7.63%; K₂O soluble in dilute hydrochloric acid, 1.35–6.80%. Their effects on the growth of Turkey Red wheat and red clover during the first two months in pots were examined and compared with the results obtained with various potassium salts. Greensands and greensand marls appear to be able to supply sufficient potassium to satisfy the demand of the two crops mentioned during the first two months of their growth. The plants yielded a greater dry weight of tops than was obtained in similar cultures where potassium salts were used. Exceptional results were obtained with one greensand, which was found to belong to the unusual class of so-called "poisonous marls." Even in this case, however, the greensand applied at the rate of 1–5 tons per acre would probably be a useful fertiliser if ground limestone at the rate of 1 ton or more per acre were also applied.—W. G.

Manganese dioxide; Action of — on nitrogenous organic substances, especially amides, with a view to the use of this dioxide as a fertiliser. G. Leoncini and C. Pieri. R. Univers. di Pisa, Istit. di Chim. agr., Stud. e. Ricerche, 1909–1914, Pt. 22, 328–348. Bull. Agric. Intell., 1918, 9, 1290–1291.

EXPERIMENTS, *in vitro*, have been made to determine whether manganese dioxide in the soil is capable of causing the oxidation of nitrogenous organic substances. Ammoniacal compounds are not oxidised by manganese dioxide. Amides of the fatty acids and urea in aqueous solution are easily oxidised at the boiling point with the formation of nitric acid, whether the solution be alkaline, acid, or neutral, but at 30° C. hardly any oxidation occurs, except in the case of dicyanodiamide which gives traces of nitric acid at this temperature. Amino-acids and their amides are not oxidised in aqueous solution either at 30° C. or at the boiling-point. Hippuric acid, uric acid and its xanthine and hypoxanthine derivatives are slightly acted on by manganese dioxide, there being a tendency for the formation of small quantities of ammonia.—W. G.

Fertilisers; Manufacture of — from ammonia. C. Bosch. Z. Elektrochem., 1918, 24, 361–369.

A DESCRIPTION is given in slight detail of methods employed in the production of fertilisers from synthetic ammonia. In the production of ammonium sulphate at the rate of 100–120 tons per day, using five saturators, each with an output of 25 tons of sulphate, trouble was experienced due to the rapid corrosion of the lead bell. Experiments showed that boiling ammoniacal ammonium sulphate solution rapidly corroded lead and the trouble was traced to the large diameter of the bell, whereby wave-motion of the liquid was set up and local supersaturation with ammonia occurred. Corrosion of the phosphor-bronze parts of the pumps and centrifuge was also produced, but was prevented by cooling the ammonium sulphate solution. It was necessary to cool slowly to obtain a salt which drained readily, and cooling by accelerated evaporation, for instance, by means of a current of air or by application of a vacuum is recommended. Ammonium sulphate is also produced by leading carbon dioxide and ammonia into an aqueous suspension of finely powdered gypsum. It is stated that in the future more ammonium sulphate will be produced by this method in Germany than was formerly obtained as a by-product

of the coking industry. A third method for the production of ammonium sulphate consists in heating ammonium bisulphite solution, prepared from ammonia and sulphurous acid, $6\text{NH}_4\text{HSO}_3 = 3(\text{NH}_4)_2\text{SO}_4 + \text{H}_2\text{SO}_4 + 2\text{S} + 2\text{H}_2\text{O}$. With concentrated solutions this reaction proceeds with explosive violence and experiments showed that the sulphur produced catalytically accelerates the reaction. By adding sulphur or another catalyst, *e.g.*, selenium, at the beginning the reaction can be carried out at a low temperature without risk of explosion. The sulphur obtained as a by-product is of high purity. Practically neutral ammonium sulphate can be obtained, instead of a mixture of sulphate and sulphuric acid, by starting with a solution containing 2 mols. NH_4HSO_3 to 1 mol. $(\text{NH}_4)_2\text{SO}_3$, and since a solution of this composition exhibits very low partial pressures of sulphur dioxide and ammonia, the process can be adapted to the recovery of sulphur dioxide from waste gases. Other products mentioned are a fertiliser made by absorbing ammonia in superphosphate; ammonium nitrate made from nitric acid obtained by the oxidation of ammonia in the presence of iron and bismuth oxides; and a product in which the four molecules of water of crystallisation of calcium nitrate are replaced by urea. Urea is produced by heating ammonium carbonate and carbamate to 130° C.–140° C. In the manufacture of ammonium nitrate it was observed that hot concentrated solutions of this salt rapidly render wrought iron very brittle.—J. F. S.

Sulphur industry and superphosphate. Tirelli. See VII.

[Cotton] bolly refuse. Dowell and Friedemann. See XIXa.

Calcium phosphate and ammonium compounds from sewage. Gonné. See XIXa.

PATENTS.

Superphosphates and the like; Apparatus for use in excavating —. C. M. Conder, Harrow. Eng. Pat. 122,709. (Appls. 2083, 5.2.18, and 12,160, 25.7.18.)

SUPERPHOSPHATE deposited in a series of parallel receptacles is discharged by a single excavator which is moved on rails in front of the series. The excavator consists of a helical blade supported on a transverse horizontal shaft, with or without lateral cutters, and it may be driven in either direction so as to transfer the cut material to one side or the other and discharge it on to tray conveyors arranged between each pair of receptacles. Alternatively a bucket cutter may be used, driven only in one direction, and the material delivered on to a reversible conveyor which conveys it to the tray conveyors. The side walls of the receptacle are carried on overhead girders by rollers, and both may be moved outwards or returned to their places simultaneously. The excavator is carried on a trolley, and rails on the trolley may be locked in continuation with the supporting rails of the receptacle.

—W. F. F.

Fertilising method and material. W. O. Snelling. Allentown, Pa. U.S. Pat. 1,289,565, 31.12.18. Appl., 16.7.18.

A CHANGE of explosive material associated with micro-organisms beneficial to plant growth is exploded in the soil.—C. A. M.

Fertiliser composition. L. L. Jackson, Assignor to O. C. Horney, New York. U.S. Pat. 1,289,789, 31.12.18. Appl., 17.3.17.

THE fertiliser contains a precipitated calcium salt, such as calcium carbonate, and a precipitated silicon compound, such as calcium silicate, with or without the addition of precipitated aluminium hydroxide and potassium nitrate.—C. A. M.

XVII.—SUGARS; STARCHES; GUMS.

Cane juices; Colouring matter of — [caused by the presence of iron-polyphenol compounds]. M. A. Schneller. Louisiana Bulletin 157. (Cf. Zerban, this J., 1918, 778 A.)

IN the clarification of raw cane juice by addition of an excess of lime followed by sodium phosphate, a very striking improvement was observed in the colour, which changed from a dark blackish tint to a bright yellow. Similarly good results were obtained by the production of another flocculent precipitate, namely aluminium hydroxide, in the juice. The author attributes this notable clarifying effect to the elimination of compounds of iron with polyphenols and phenolcarboxylic acids, the so-called "tannins," which are present in the vascular bundles of the eyes, shoots, and tops of the cane. An aqueous extract of young shoots gave a very strong greenish-black coloration with ferric salts, and by soaking bagasse in a solution of ferric chloride it was stained black, the colour of the eyes being particularly intense. Compounds such as iron glucosate or saccharate are incapable of accounting for so deep black a colour. An analogous effect is observed in the case of freshly expressed beet juices, which darken rapidly on account of the presence of catechol and traces of ferrous salts, the latter being oxidised by the action of an oxidase. In the cane sugar factory, the colour due to the presence of such compounds may be decomposed by heating with phosphoric acid, but the clear yellow liquor thus obtained darkens again on cooling, when the compound is re-formed. Sulphurous acid acts similarly, its influence being principally due to reduction, but here again the effect is not permanent, since a sulphited syrup may darken gradually at its surface; while a sugar boiled from such a syrup, though of good colour at first, may darken more or less after a time, due to re-oxidation. Complete elimination of the colour-forming impurities is accomplished by the aluminium hydroxide process of clarification mentioned, or more practically and economically by a method of carbonation, as, e.g., by warming the clarified juice to 50° C., liming to 3–4 c.c. (of N/10 acid per 100 c.c.), carbonating back to 0.5 c.c., heating to boiling, filtering, sulphiting to slight acidity, and again filtering. Juice thus clarified should be concentrated and grained in evaporators and vacuum pans of copper, aluminium, or suitable rust-proof enamel; or alternatively, if a plant of iron be used, the formation of glucosates (which result from the action of alkalis on reducing sugars at high temperatures, and also give an intensely dark colouring matter) should be avoided by heating in neutral or slightly acid solution. Animal charcoal and decolorising carbon are capable of removing this colouring matter completely by adsorption.

—J. P. O.

[Sugar] juice clarification and decolorisation with a new carbon. S. S. Peck and A. Adams. Hawaiian Chem. Assoc., Oct. 28, 1918. Int. Sugar J., 1919, 21, 72–74.

IN laboratory experiments made with a new decolorising carbon (see U.S. Pat. 1,251,546; this J., 1918, 133 A), the best results were obtained by using it

as a filter layer, instead of mixing the liquor to be treated with the carbon and subsequently filtering. Increases in purity as high as 4.4° from clarified juices were obtained, though generally the increase was smaller, depending upon the number of times the carbon was used and the amount of juice that was passed through it. About 95% of the colour could be eliminated from the juice at first, but as the carbon became charged with impurities this amount gradually sank to 70%. Factory-scale tests were also made. The carbon was placed in frames in a filter-press and gave a clear, almost colourless filtrate when clarified juice was passed through it. The passage of juice through the carbon was continued until the rate of flow was considerably retarded. The remaining sucrose was readily washed out from the filter-press, and hot water and steam were then passed through, the runnings thus obtained being very dark and of an extremely disagreeable odour and taste. Following this treatment, juice was again passed through the carbon layer, and the increase in purity and the removal of the colour were still satisfactory, though less so than before. These operations were repeated six times, the highest increase in purity noticed being 2.6°, and the lowest 1.2°, while the amount of colour eliminated varied from 87% during the first hour's run to 60% at the end of an hour's test after the seventh time of re-use. In addition to the partial removal of colour, there was an almost complete disappearance of the flavour peculiar to raw cane juice. The treated juice evaporated and grained very readily, owing to the decreased amount of gums and other viscous matters present. Moreover most of the scale-forming impurities were removed from the juice, the evaporators after several days' use showing no deposit, whilst the ash content of the carbon increased from 30 to 60%.—J. P. O.

Decolorising carbons; Investigations on —, using "Carboraffin." V. Stanek. Z. Zuckerind. Böhm., Oct., 1917 and 1918; Tijdschr. Algem. Tech. Vereen. Beetwortelsuikr. in Raffin., 1919, No. 8, 116–122.

ACCORDING to the author, "Eponit," "Norit," and "Carboraffin" (which much resemble one another) are prepared from wood, peat, etc., by Zelnicek's method (Austrian Pat. 68,169; Fr. Pat. 471,295; this J., 1915, 216), though some modification may sometimes be used. In experiments with "Carboraffin" for decolorising syrups in the refinery, the best results were obtained by passing the liquor through a layer of the carbon, in a special pressure filter, a layer of kieselguhr or of fine asbestos fibre being deposited upon the cloth before introducing the carbon. Tests on the large scale in a refinery in Bohemia showed that working with slightly acid liquors at 96°–98° C. a greater decolorisation was obtained with 0.07% of "Carboraffin" than with 6.5% of animal charcoal. Several disadvantages, however, were noticed, the principal of which were the slowness of filtration and the difficulty in obtaining a perfectly bright filtrate. In spite of much care, particles of the carbon passed over into the filtrate, these appearing later as black specks on the surface of the finished sugar "loaves."—J. P. O.

Colloid chemistry of Fehling's sugar test. M. H. Fischer and M. O. Hooker. J. Lab. and Clin. Med., 1918, 3, No. 6. Int. Sugar J., 1919, 21, 76–78.

IN the determination of sugars by reduction of Fehling's solution, the precipitate is not always bright red, but sometimes orange or yellow, whilst occasionally only a greenish discoloration is obtained, from which a light greenish or dirty

yellow precipitate may settle out in the course of many days. The yellow precipitate has frequently been described as a hydrated form of the oxide. According to the authors, however, the composition of the oxide, whatever its colour may be, is identical, and the varying colour is due to differences in the degree of subdivision, depending upon the particular conditions prevailing during precipitation. If Fehling's solution be mixed with a small quantity of a solution of reducing sugar at the ordinary temperature, a series of such colour changes may be observed. The originally clear solution first becomes less transparent, then the colour changes to a leaf green, and next to a yellowish green. At this time more or less precipitate may separate out; while later, not only this yellow precipitate, but the supernatant liquid as well, becomes yellow orange, then brilliant orange, and finally bright red. Microscopical examination shows that as the different colours are being developed there is coincidentally a gradual increase in the size of the particles. Hence a positive reaction indicates the presence of a reducing substance, whether it is merely a dirty green solution, a yellow or orange precipitate, or a bright red precipitate. To ensure the formation of the red precipitate a small amount of reducing sugar should be used, for with much present the number of points at which the copper salt is attacked and reduced will evidently be much greater than when only a small amount is present. Cuprous oxide in any of its intermediate states of subdivision may be stabilised by the addition to the reaction mixture of a suitable hydrophilic colloid, *e.g.*, gum or egg albumin; some of the degradation products resulting from the action of the alkali of the Fehling's solution on the reducing sugar are themselves hydrophilic in type. Temperature also may play a part in determining the state of dispersion, and reduction at a high temperature (as in the usual procedure) is more likely to yield the colloidal types of reduction products than at the ordinary temperature. Thus, a urine containing a small amount of reducing substances which upon boiling with Fehling's solution yields only a dirty green solution will show a bright red precipitate if the same proportions are simply mixed and set aside at the ordinary temperature for 24 hours.—J. P. O.

Soluble starch; Determination of — in the presence of starch and its hydrolytic cleavage products. J. C. Small. J. Amer. Chem. Soc., 1919, 41, 107—112.

THREE grms. of the sample is suspended in about 200 c.c. of water which is then raised to the boiling point with continuous agitation. The solution is cooled, made up to 250 c.c. and filtered to remove the ordinary starch, if necessary, after centrifuging. Two hundred c.c. of the filtrate is placed in a 500 c.c. centrifuge bottle and 10 c.c. of 4% iodine solution in 6% potassium iodide solution is added. An equal volume of saturated ammonium sulphate solution is added and the iodine compound of soluble starch is thereby precipitated. The liquid is centrifuged at a moderate speed, the reddish-brown supernatant liquor siphoned off, the precipitate shaken with water, again precipitated with an equal volume of saturated ammonium sulphate solution and again centrifuged. Five washings in this manner are generally sufficient to remove the red coloration due to dextrin. All the liquors should be passed through a filter before being discarded, and the precipitate on the filter is finally washed back into the bottle. The washed precipitate is transferred to a flask with a total volume of water not exceeding 300—400 c.c.; 5 c.c. of hydrochloric acid (sp. gr. 1.125) is added and the liquid is boiled for 2½ hours so as to reduce its

volume to about 200 c.c. A further quantity of 20 c.c. of hydrochloric acid is added and the whole heated in a boiling water bath for 4 hours under a reflux condenser. The quantity of dextrose is estimated polarimetrically and calculated to starch. Control analyses have shown the accuracy of the method, even when soluble starch is mixed with large quantities of commercial dextrin. It is to be noted, however, that amylopectin yields an iodine compound which is precipitated by half-saturated ammonium sulphate solution in the presence of excess of iodine. Amylopectin may therefore be determined by the difference in the results obtained, on the one hand by adding iodine solution with each of the washing liquors, to preserve the excess of iodine, and on the other by washing out the whole of the iodine with ammonium sulphate solution.—J. F. B.

Soluble starch; Method for the preparation of —. J. C. Small. J. Amer. Chem. Soc., 1919, 41, 113—120.

THE method of preparing a soluble starch by boiling with alcoholic hydrochloric acid has been studied, in order to fix the most favourable conditions for complete conversion without the formation of more profoundly modified products. Alcohol of 95% strength and hydrochloric acid of sp. gr. 1.19 were employed. Time of treatment, concentration of acid, and proportion of liquid to starch were varied. The highest yield of soluble starch was obtained when 0.75 c.c. of strong hydrochloric acid was added to 100 c.c. of 95% alcohol and used for the conversion of 20 grms. of starch, the liquid being boiled for 10 minutes with good agitation. The exact quantity of sodium bicarbonate required to neutralise the acid was added at once and the product filtered off, washed with alcohol, and dried. Under favourable conditions it is possible to produce a completely converted starch, which shows no reaction for erythrodextrin and no cupric-reducing power.—J. F. B.

PATENTS.

Vegetable glue or adhesive. C. Bergquist, Assignor to F. W. Tunnell & Co., Philadelphia, Pa. U.S. Pat. 1,287,841, 17.12.18. Appl., 15.12.17.

A GELATINISING starch adapted to yield a clear film in drying is prepared from starch and hexamethylenetetramine.—C. A. M.

Vegetable charcoal. Eng. Pat. 122,465. See IIB.

Decolorising carbon. Eng. Pat. 122,698. See IIB.

Decolorising carbon. U.S. Pat. 1,290,002. See IIB.

XVIII.—FERMENTATION INDUSTRIES.

Wood; Alcohol from —. Laskowsky. Chem.-Zeit., 1919, 43, 51.

AN account is given of the operation of a plant for the production of alcohol from sawdust by Classen's process which was worked in England 12 years ago. The plant comprised an autoclave of 12 cub. m. capacity, a lixiviating plant with neutralising vessels, filter-presses, fermentation tuns, storage vats for the fermented wash, stills, spirit storage vats, and spent-wash pits. The autoclave had a steam jacket and a homogeneously lead-lined interior, and could be slowly rotated. The charge was 1 ton of sawdust with a solution of sulphurous acid. The steam pressure in the jacket was 4 atmos. giving an internal temperature of

145° C. and a pressure of 7 atmos. This pressure was maintained for a certain time and the sulphur dioxide then released. The conversion was complete in 45–60 minutes. The average saccharification corresponded to 22% of reducing sugar calculated on the dry substance of the wood. In the most favourable cases about 60% of this reducing sugar was fermentable. The converted sawdust was lixiviated with water, the solution was neutralised with chalk, and filtered. The sweet worts at 10–15% of extract were fermented partly direct and partly with the addition of nutrient salts. The fermentations were extremely slow and the yield of alcohol amounted in favourable cases to 5–6 litres per 100 kilos. of dry wood substance. The sawdust contained about 20% of moisture and cost £1 per ton. Classen's process has undergone many improvements in recent years, and it should be possible now to double the above yield of alcohol. The residue from the lixiviating plant could be used for mixing with molasses and with evaporated spent-wash for fodder purposes.—J. F. B.

System of drying. Petit. See XIXA.

Effect of acids on B. coli. Wyeth. See XIXA.

PATENTS.

Beverages; Manufacture of extracts of beer and other fermented —. Manufacture of liquid-condensed yeast-treated extracts from beverages.

H. Heuser, Chicago, Ill. U.S. Pats. (A) 1,290,191 and (B) 1,290,192, 7.1.19. Appl., 11.12.16 and 5.4.17.

(A) FERMENTED beverages such as beer are concentrated and afterwards subjected to fermentation with yeast. (B) Syrups capable of conversion into beverages by dilution with water, are produced from partially fermented beverages such as beer wort, by concentration and subsequent fermentation with yeast.—J. H. L.

Glycerol; Process of manufacturing —. J. R. Eoff, jun., Washington, D.C. U.S. Pat. 1,288,398, 17.12.18. Appl., 21.7.17. (Dedicated to the public.)

GLYCEROL is produced by fermenting a sugar in an alkaline medium.—C. A. M.

XIXA.—FOODS.

Milk; Methods of calculating added water in —. L. J. Harris. Analyst, 1919, 44, 43–45. (See this J., 1918, 712 A.)

A TABLE is given showing percentages of solids-not-fat in fat-free milk and in milk of minimum standard composition corresponding with percentages of added water; this table is constructed from the formula given previously (*loc. cit.*). The figures may also be used in the form of an alinement chart or as a calculating (slide) rule.—W. P. S.

Cabbage; Antiscorbutic value of —. I. Antiscorbutic and growth-promoting properties of raw and heated cabbage. E. M. Delf. Biochem. J., 1918, 12, 416–447.

It has been shown experimentally that a very small amount of raw cabbage daily in conjunction with a diet of grain and autoclaved milk is sufficient to afford protection from symptoms of scurvy. The antiscorbutic factor of cabbage is exceedingly sensitive to heat. After heating for 1 hour at 60° C., 70% is lost, and at 90° C. over 90% is destroyed. The results indicate broadly that the least loss of antiscorbutic properties will be obtained by cooking green vegetables for a short time

at a higher temperature, rather than for a longer time at a lower temperature. Steaming should be employed, for preference, but if boiling is adopted, the addition of either acid (citric acid) or alkali (sodium carbonate) should be avoided.—W. G.

Cabbage; Antiscorbutic value of —. II. Effect of drying on the antiscorbutic and growth-promoting properties of cabbage. E. M. Delf and R. F. Skelton. Biochem. J., 1918, 12, 448–464.

THERE is a loss in antiscorbutic properties of more than 93% when cabbage is dried at a low temperature and stored for 2–3 weeks, and if the storing is prolonged to 3 months nearly all the protective value of the fresh material is lost. The loss is not so great if the cabbage is plunged into boiling water before drying. During drying and storage there is also destruction of the fat-soluble, growth-promoting factor, the loss being about 86% at the end of two weeks. The preservation of vegetables by drying is an unprofitable process having regard to the labour and fuel involved, to the low nutritive and antiscorbutic value of the product, and to the subsequent deterioration on storage.—W. G.

Drying [milk, eggs, etc.]; New system of —. P. Petit. Brasserie et Malterie, 1918, 8, 282–287.

THE desiccation of milk and eggs, for purposes of preservation and transport, has been carried out on a very large scale at Bucarest with a new type of apparatus in which the liquid is atomised by striking a rapidly rotating plate. The liquid is injected, together with air, into an atomising chamber in which it strikes a rotating plate situated in front of the outlet. The mixture of air and liquid particles passes into a cylindrical drying chamber into which hot air, e.g., at 100°–120° C., is introduced. The air is rapidly cooled by evaporation of the moisture and the dried particles never attain a high temperature. In a second form of apparatus described, the rotating plate is absent. The liquid is injected as a spray into the lower end of a vertical cylinder and is carried upwards and dried by a helical current of hot air. The dried material is carried by the air into a separator. It is suggested that the principle of the rotating plate system might be applied to the drying of malt, brewers' spent grains, and yeast, the material being scattered by falling on the plate and dried by subsequently falling through a rising column of hot air.—J. H. L.

Drying and concentrating liquids at low temperatures; The Marmier and Canonne apparatus for —. L. Marmier. Ann. Inst. Pasteur, 1918, 32, 145–149. Bull. Agric. Intell., 1918, 9, 1360–1362.

THE apparatus, intended for the concentration or desiccation of liquids such as milk or grape must, consists of a vertical cylindrical water-jacketed still in communication with a suitable condenser and a vacuum pump. The liquid to be treated enters the still from above through a hollow vertical rotary shaft which passes through the hood of the still and bears, inside the latter, hollow radial arms provided with nozzles, so that the liquid is sprayed against the hot walls of the still and rapidly evaporated. The shaft also carries scrapers which remove the concentrated or desiccated material from the walls of the still and sweep it over the floor towards a sunken chamber, at the centre, from which it is afterwards discharged. The evaporation of the sprayed liquid is so rapid that with proper regulation of the rate of inflow, rotation of the shaft, and temperature of the jacket, it is often possible to keep the shaft in continuous rotation, but if necessary a pause may be made after each complete rotation. In conse-

quence of the rapid evaporation the temperature of the material is considerably below that of the jacket, e.g., in concentrating fresh grape must, with the jacket at 36°–40° C., the temperature of the must itself did not exceed 26°–26° C.—J. H. L.

Flours; Composition of various — used as substitutes for wheat flour. Balland. Ann. Falsif., 1918, 11, 388–390.

The following is the composition of various flours etc. which have been used in bread-making:—

	Moisture	Proteins	Fat	Starch	Cellulose	Ash
Morocco beans:						
Flour (yield 80%)	10.28	26.66	1.44	58.32	•	3.30
Bran (yield 10%)	10.90	19.49	4.49	81.45		2.93
Maize, parti-coloured, U.S.A.:						
Flour (yield 86.3%)	13.18	8.73	4.14	70.23	2.36	1.36
Bran (yield 5.4%)	12.78	4.69	1.83	65.75	14.40	1.10
Maize, La Plata:						
Flour (yield 86.9%)	12.20	9.23	4.29	72.23	0.93	1.12
Bran (yield 6.2%)	11.12	9.43	7.38	60.58	9.11	2.38
Buckwheat:						
Flour (yield 72.2%)	16.52	8.74	1.66	71.15		1.95
Millet, Algerian:						
Flour (yield 54.6%)	12.53	15.70	6.28	61.42	9.88	3.20
Bran (yield 15.9%)	10.16	5.40	1.40	(+ extractives) 43.34	22.30	17.10

—W. P. S.

Animal carcasses etc.; Utilisation of —. Frabot. Ann. Chim. Analyt., 1919, 1, 55–65.

For the utilisation of carcasses of diseased animals, offal, etc., a process is recommended by which fats and gelatin are recovered and the remainder of the material converted into a meat-meal. The carcass or other raw material is placed in a perforated rotating cylinder mounted horizontally in a steam-jacketed autoclave and the cooking operation is maintained for 4 to 5 hours. During this time, fats and soluble substances collect in the autoclave and are drawn off and passed into a fat-separating apparatus, the aqueous portion is then conducted to an evaporator in which it is concentrated to form glue. The hot vapours from the evaporator may be used for heating the autoclave. After the fats etc. have been withdrawn from the autoclave, the perforated cylinder is rotated while the mass of material is dried; the disintegrated material, as it dries, falls through the perforations and is reduced to a fine powder in the autoclave. This drying operation takes from 2 to 5 hrs. The whole apparatus is self-contained; any vapours evolved and which cannot be utilised are either condensed or conducted to a flue and burned with the furnace gases. The meat-meal obtained contains: water, 8; proteins, 50 to 60; phosphoric acid, 8; and fat, 10 to 12%; it may be used as a pig or poultry food.—W. P. S.

Food canning; Utility of blanching in —. Effect of cold shock upon bacterial death rates. E. M. Bruett. J. Ind. Eng. Chem., 1919, 11, 37–39.

PRELIMINARY heating followed by chilling does not, apparently, render bacterial spores more sensitive to the effects of heat, and blanching (immersion first in boiling and then in cold water) as a preliminary to the cold pack process of canning is not justified on the basis of increased susceptibility of the bacteria to sterilisation because of "cold shock." Blanching, however, has a marked cleansing effect, and hence fewer spores are introduced into the canned material; as the time required for sterilisation varies with the initial contamination, it is desirable to reduce this as much as possible.

—W. P. S.

Sorghums; Fats and fatty acids of the grain —. C. K. Francis and W. G. Friedemann. Okla. Agric. Exp. Stat., Bull. 117, 1917. 14 pages.

THE nature of the fat present in kafir, feterita, and milo, the chief varieties of the grain sorghums, was determined. Six fatty acids were found, namely, oleic and linolic (80–86% of the fat), stearic and palmitic (7–10%), butyric and formic (0.59–0.85%). Traces of saturated acids higher than stearic were found in kafir and milo fat.

—J. H. J.

Bolly refuse [from cotton]; Experiments with —. C. T. Dowell and W. G. Friedemann. Okla. Agric. Exp. Stat., Bull. 121, 1918. 8 pages.

BOLLY refuse consists of the burr and some unginned cotton from unopened bolls of cotton gathered at the close of the picking season. Feeding experiments on cattle showed that the refuse was readily eaten, serving as a good roughage, and that when the percentage of cotton was high the animals gained in weight. The results of a chemical analysis of the refuse were: moisture 12%, ash 6%, protein 10%, fibre 41%, nitrogen-free extract 40%, fat 2.5%. A mechanical analysis showed: cotton 10%, seed 15%, burrs 75%. A sample containing only 4% of seed was unsuitable as a feeding stuff. The seed from the bolls and the oil cake made from it were of inferior quality. The ash is rich in phosphate and potash, and is a good fertiliser.—J. H. J.

Vegetable fibres; Determination of the digestibility of the cellulosic part of —, especially woody fibres. P. Waentig and W. Gierisch. Z. physiol. Chem., 1918, 103, 87–103.

To obtain material of a moderately high degree of digestibility from woody matter requires thorough removal of the lignified substance from the fibres. The following method has been devised for obtaining rapidly an approximate measure of the material which is non-saccharifiable and therefore undigestible, and which interferes with the digestion of the nutrient constituents in woody substances; the method is based on the fact that, when chlorine acts on woody fibre, the lignin is at first almost exclusively attacked, the proportion of lignin present thus corresponding with that of the chlorine absorbed. 10 grms. of the material is moistened thoroughly but not to such an extent that water separates from it and introduced into a wide-necked gas-washing bottle with a ground top; the bottle is then tared and connected, by way of a tower charged with wet pumice and a bubble-counter, with a source of chlorine. A slow stream of chlorine is passed through the material for half an hour, the apparatus being then freed from excess of chlorine and weighed to within 0.01 gm.; this

procedure is repeated as long as any appreciable increase in weight occurs, 1–2 hours being usually sufficient. The "chlorine number" represents the percentage increase in weight, calculated on dry matter. The losses due to evolution of water vapour and of the volatile acids formed by the action of the chlorine are very small; the chlorine taken up by the water present amounts to 0.7 gm. per 100 c.c. at the ordinary temperature. In isolated cases of hard, resinous woods not very finely divided, the limit of absorption is indistinct owing to diffusion being difficult; such cases are, however, those of fibres very rich in lignin, which give chlorine numbers of about 45%, and may at once be characterised as indigestible. As a general rule, the chlorine number and indigestibility increase or diminish together. Processes for the removal of the woody substance from woody fibres must reduce the chlorine number to about 20 to give a moderately digestible cellulosic fodder, or to 20 or less if a highly digestible material is required. The chlorine numbers of natural straws do not differ greatly, the mean being 31.8; straws which have been treated with alkali or otherwise give values of 20, 15, or even less.—T. H. P.

Amino-acids [from caseinogen]. H. D. Dakin. *Biochem. J.*, 1918, 12, 290–317.

THE author describes a new method of separation of the products of hydrolysis of proteins and gives an account of its application to the hydrolysis of caseinogen. After hydrolysis of the protein with sulphuric acid, and subsequent removal of the latter as barium sulphate, the neutral concentrated solution of amino-acids was submitted to continuous extraction with butyl alcohol, and five fractions were obtained:—(1) Mono-amino-acids, both aliphatic and aromatic, which although insoluble in butyl alcohol, were extracted in the above process, but deposited as a cream-coloured, granular powder in the extraction flask. (2) Proline, soluble in alcohol, and extracted by the butyl alcohol. (3) Peptide anhydrides (diketopiperazines) extracted by butyl alcohol but separated from (2) by their sparing solubility in alcohol or water. (4) Dicarboxylic acids, not extracted by butyl alcohol. (5) Diamino acids not extracted by butyl alcohol, but separable from (4) by phosphotungstic acid and other means. No indication of racemisation of the products during the process was observed, this being of importance in the application of the method to the preparation of material for bacterial and animal metabolism experiments. By this method fraction (1) is readily obtained as a dry, almost neutral, amino-acid mixture suitable for furnishing a basis for nutrient media with or without the addition of tryptophan. Further, since most of the amino-acids which furnish dextrose in the diabetic organism are absent from this mixture, there are possibilities of its use for dietetic purposes. The method of extraction with butyl alcohol was found to be applicable to the products of digestion of caseinogen by active pancreas extract and readily furnished tryptophan in a pure state. The method could probably be operated on a considerable scale and may be of service in obtaining tryptophan for bacteriological and other purposes. A new hydroxyamino-acid, β -hydroxyglutamic acid, and a new peptide, *D*-isoleucyl-*D*-valine anhydride (isopropyl-*sec*-butyl-diketopiperazine), were isolated. (See further *J. Chem. Soc.*, Apr., 1919.)—W. G.

Carnosine, its constitution and synthesis. G. Barger and F. Tutin. *Biochem. J.*, 1918, 12, 402–407.

FROM its behaviour towards 2,4,5-trinitrotoluene carnosine is shown to be β -alaninehistidine. It has

been synthesised by condensing β -nitropropionyl chloride with histidine methyl ester and reducing the resulting product with stannous chloride and hydrochloric acid. (See further *J. Chem. Soc.*, Apr., 1919.)—W. G.

Cotton seed. De Segundo. See XII.*

Alcohol from wood. Laskowsky. See XVIII.

Saccharin in tablets. Bonis. See XX.

Selective coloration of lignified plant membranes. Bugnon. See XXIII.

PATENTS.

Cocoa butter; Process for deodorising and decolorising —. Co-operative Wholesale Soc., Ltd., Manchester, G. Martin, Manchester, and W. J. Brizell, Liverpool. Eng. Pat. 122,512, 9.2.18. (Appl. 238/18.)

Cocoa butter is deodorised and decolorised by passing steam through it at a high temperature, e.g., 140° C. The material is heated to the required temperature in a pre-heating vessel fitted with stirring mechanism, and discharged under gravity into a steam-jacketed still provided with an internal perforated coil for the injection of steam into the charge. The steam issuing from the still-head is condensed in cooling coils and discharged into an effluent chamber in which a vacuum may be maintained. The duration of treatment varies from 20–40 mins. to several hours. In a modified form of the process, suitable for the treatment of small quantities of cocoa butter, the steam is generated in the heated charge by introduction of moist material such as potatoes; the solid residue of the latter assists in the subsequent clarification of the charge.—J. H. L.

Cream; Method and apparatus for deodorising —. J. Priskey, Detroit, Mich. U.S. Pat. 1,286,404, 3.12.18. Appl., 7.9.17.

THE apparatus comprises a container into which the cream is fed continuously, a hollow porous body, immersed in the cream, through which compressed air can be forced, and a downwardly directed jet of air above the cream for breaking the froth.—W. R. S.

Utilising animal carcasses. Ger. Pat. 308,753. See XV.

XIXb.—WATER PURIFICATION; SANITATION.

Calcium phosphate and ammonium compounds; Production of — from sewage. J. Gonné. *Chem.-Zeit.*, 1919, 43, 39–40.

SEWAGE is separated into its solid and liquid constituents in receivers the special construction of which prevents the escape of volatile ammonia compounds. The separation is accelerated by the addition of certain waste products, which clarify the liquid and cause a preliminary precipitation of phosphoric acid, and the precipitation is completed by the addition of a concentrated solution of calcium salts (also waste products). Sodium phosphate may also be added. After separating and pressing the solid matter, the liquid is transferred to a distillation apparatus, the free ammonia is distilled, and the dissolved phosphoric acid pre-

precipitated. The precipitate from this second precipitation process consists of pure calcium phosphate containing at least 40% of water-soluble and citrate-soluble phosphoric acid. The sludge obtained in the first precipitation normally contains 3 to 5% of nitrogen, 12 to 15% of phosphoric acid, and 1 to 2% of potassium. When dried and powdered it closely resembles guano in composition, and can be used by itself as a fertiliser or in admixture with ammonium sulphate, which is also obtained in the process.—C. A. M.

Bacillus coli; Effect of acids on the growth of —. F. J. S. Wyeth. *Biochem. J.*, 1918, 12, 382–401.

All strains of *B. coli*, whether of human or bovine origin, behave similarly when exposed to similar conditions. The degree of acidity finally produced by a culture of *B. coli* cannot be used for diagnostic purposes, the value not being a "physiological constant" but dependent on three factors, namely: (1) the initial H-ion concentration of the medium; (2) the composition of the medium, especially the degree to which it is "buffered"; (3) the nature of the acid used to produce the initial reaction of the medium. There is a definite latency of growth of *B. coli*, when the amount of acid added is insufficient completely to inhibit the fermentation. For any given medium, a greater initial addition of acid causes a longer latent period. Each acid has its own specific effect in inhibiting the growth of *B. coli* in a given medium, highly dissociated acids being more strongly inhibitory than those undergoing a less degree of dissociation. For a mixture of any given medium and acid there appears to be a definite "critical point" beyond which the slightest rise in the degree of acidity results in a complete inhibition of the growth of *B. coli*.—W. G.

Basic exchange in silicates. Ramman and Spengel. See VII.

Fertilising power of sewage. Masoni. See XVI.

PATENTS.

Sewage and other liquids; Purification of —. W. Jones, Stourbridge, and Jones and Attwood, Ltd., Amblecote, Staffs. Eng. Pat. 122,428, 24.8.17. (Appl. 12,136/17.)

SEWAGE is treated with bacterial (activated) sludge and the mixture agitated by the injection of air. The sludge is separated continuously or intermittently from the liquid, and passed to another tank where its activity is intensified by the injection of air, and the active sludge is returned to the treating tank. The separation of the sludge is effected in a series of tanks so arranged that the mixture flows through them at varying rates, and sludges of varying specific gravity are separated and deposited in separate sludge pits connected with the settling tanks. All the operations form a continuous cycle. (See also Eng. Pats. 22,736 of 1914 and 111,720; this J., 1916, 195, and 1918, 72A.) —W. F. F.

Sewage; Method of and apparatus for treating —. P. F. Brown, Huntingdon, N.J. U.S. Pat. 1,289,378, 31.12.18. Appl., 2.5.18.

THE flow of sewage is directed downwards through the central portion of each of a series of compartments, to promote rapid subsidence of solid materials, means being provided to divide the flow so as to break up the solids and allow the contained gases to escape. The sewage is then con-

veyed upwards and discharged at the opposite sides of the compartment, into the next compartment, and so on, until finally it is discharged from the apparatus at the opposite sides of the last compartment.—C. A. M.

Purifying and disinfecting air; Apparatus for —. W. J. Calder, Edinburgh. Eng. Pat. 122,438, 10.8.18. (Appl. 579/18.)

THE air is passed through a number of superposed wire resistance grids, which are spaced apart in a vertical tubular vessel having a flared upper end. The grids are heated electrically to incandescence. —W. H. C.

Air-purifier. U.S. Pat. 1,289,421. See I.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS

Morphine determination; Effect of morphine concentration on the B.P. method of —. H. E. Annett and H. Singh. *Analyst*, 1919, 44, 41–43.

THE B.P. method gives low results in the case of opiums of low morphine content; for example, when the morphine falls below 5%, the results obtained are about 0.5% too low. The method, however, is accurate when applied to opiums of normal morphine content (about 10%); useful results can be obtained when only 2 grms. of the sample is available for the determination provided that correspondingly reduced quantities of reagents are employed and the corresponding corrections applied. (See also this J., 1918, 315 T.)—W. P. S.

Morphine; Use of ethyl acetate in the determination of — in opium. O. von Friedrichs. *Pharm. Zentralh.*, 1918, 59, 529–530.

ETHYL acetate is used in place of ether in the determination of morphine in opium by the methods of the German, Swedish, Belgian and other pharmacopœias. As a rule it gives slightly lower values, which may be attributed to hydrolysis of the ethyl acetate by the excess of ammonia, especially when the solution is left for a long time in contact with the ethyl acetate, as in the method of the Swedish pharmacopœia. Under these conditions the liberated acetic acid is shared between the ammonia and the alkaloid, and a certain proportion of the crystallised morphine is dissolved again. Impure ethyl acetate containing methyl formate and amyl acetate gave very low results in the method. Under ordinary conditions the difference between the results obtained with ether and with pure ethyl acetate in the determination of morphine in a sample of opium was less than 0.1%.—C. A. M.

Alkaloid of Isopyrum thalictroides, L.; Microchemical reactions and localisation of the —. M. Mirande. *Comptes rend.*, 1919, 168, 316–317.

THE alkaloid, isopyrine, gives the following microchemical reactions in the plant cells:—(1) with iodine in potassium iodide a granular, brown precipitate completely filling the cells, and which by the controlled action of water, alcohol, and the reagent, can be transformed into a mass of brown acicular crystals, soluble in sodium thiosulphate; (2) with picric acid, an immediate, very dense, yellow, granular precipitate; (3) with mercuric chloride, an immediate, dense, white precipitate; (4) with gold chloride or platinum chloride, a dense yellow precipitate; (5) with moderately dilute sulphuric

acid, an accumulation of oily drops, which soon coalesce into one or several large masses, changing gradually into collections of greyish crystals, which soon dissolve and are replaced by crystals of calcium sulphate; (6) with ammonia, a dense, granular, bright yellow precipitate, insoluble in water, soluble in alcohol; (7) with solutions of potassium hydroxide, potassium bichromate, or sodium molybdate, finely granular, yellowish precipitates. The alkaloid occurs principally in the subterranean organs of *Isopyrum thalictroides* and to a lesser extent in the green aerial organs.—W. G.

Digitalis leaves; Effect on activity of temperature during drying of —. H. C. Hamilton. J. Amer. Chem. Soc., 1919, 41, 125—129.

EXPERIMENTS were made to test a statement that digitalis leaves yield a more active extract if previously dried in an oven at 75°–90° C. than if extracted in the fresh or air-dry condition, this statement being at variance with previously accepted experience. The extracts were made with 95% alcohol and their toxic activity was tested by administering to frogs in increasing doses. The results showed that the extracts from fresh leaves were the most powerful. The preparations made from sun- and air-dried leaves showed considerably lower values, and those from oven-dried leaves were rather less active than the air-dried.—J. F. B.

Stovaine and cocaine; Microchemical identification of —. Denigès. Bull. Soc. Pharm. Bordeaux, 1917, No. 4. Ann. Chim. Anal., 1919, 1, 65—66.

With platinum chloride, a 1% stovaine hydrochloride solution yields a fine granular precipitate, but a precipitate does not form if the concentration of the stovaine solution is as low as 0.5%. Cocaine hydrochloride solution of either strength gives a characteristic crystalline precipitate of the platinumchloride. Both alkaloids give yellow crystalline precipitates when treated with gold chloride, but the microscopic appearance of the crystals is different. Stovaine picrate forms yellow crystals, whilst cocaine picrate appears as amorphous granules which change to liquid droplets when stirred. (See also J. Chem. Soc., Apr., 1919.)—W. P. S.

Urea; Formation, by oxidation, of organic substances of an intermediate character spontaneously producing —. R. Fosse. Comptes rend., 1919, 168, 320—322.

WHEREAS proteins such as casein, or amino-acids such as asparagine or glycine, only give a very small yield of urea when oxidised with potassium permanganate, the yield is very considerably increased if the products of oxidation are heated with aqueous ammonium chloride. (See further J. Chem. Soc., Apr., 1919.)—W. G.

Saccharin; Determination of — in tablets. A. Bonis. Ann. Falsif., 1919, 11, 369—372.

The tablets usually consist of saccharin or sodium saccharinate mixed with sodium bicarbonate and, possibly, lactose. Titration with N/10 sulphuric acid, using methyl orange as indicator, gives the quantity of free sodium bicarbonate present. Saccharin is determined by fusing the sample with a mixture of sodium carbonate and sodium nitrate, and precipitating the resulting sulphate as barium sulphate. The quantity of sulphur found is calculated into saccharin and, if the product did not effervesce when mixed with water, this is expressed as sodium saccharinate. If effervescence

occurred it indicates that free saccharin was present and this is determined by extracting the material with ether; the quantity of saccharin which may be present as sodium saccharinate is found by fusing the residue insoluble in ether with sodium carbonate and sodium nitrate as described. Lactose, if present, is also determined. To detect the presence of *p*-sulphaminobenzoic acid, 1 grm. of the substance is hydrolysed by boiling for 2 hrs. with dilute hydrochloric acid, the solution is evaporated to about 10 c.c., and cooled. The *p*-sulphaminobenzoic acid crystallises out within 24 hours, and is collected, washed with a little cold water, dried at 100° C., and weighed. (See also Richmond and others, this J., 1919, 53 A.)—W. P. S.

Mustard gas [2,2-dichloroethyl sulphide]; Physical constants of —. L. H. Adams and E. D. Williamson. J. Wash. Acad. Sci., 1919, 9, 30—35.

THE compressibility of 2,2-dichloroethyl sulphide has been determined over the pressure range 392—1713 megabars (1 megabar=0.987 atm.) at 31.5° C. The compressibility at $P=0$ is 49.5×10^{-8} per megabar and at 1000 megabars 34.4×10^{-8} per megabar. The melting point at atmospheric pressure is 13.9° C., and the pressures required to induce freezing at higher temperatures are 570 megabars at 21.0° C., 1210 at 31.4° C., and 1800 megabars at 38.9° C. The decrease in volume on solidification at the temperatures and pressures mentioned is 0.051, 0.050, 0.047, and 0.042 c.c. per grm. respectively. The latent heat of fusion is 25 cal. per grm.—J. F. S.

Methyldichloroarsine; Manufacture of —. R. H. Uhlinger and R. V. Cook. J. Ind. Eng. Chem., 1919, 11, 105—109.

THE steps in this manufacture are as follows: (1) Sodium arsenite solution is treated with methyl sulphate at 85° C.: $\text{Na}_2\text{AsO}_3 + (\text{CH}_3)_2\text{SO}_4 = \text{Na}_2(\text{CH}_3)_2\text{AsO}_3 + \text{Na}(\text{CH}_3)_2\text{SO}_3$. In this reaction a considerable proportion of the methyl sulphate is lost owing to its hydrolysis to sodium methyl sulphate and methyl alcohol by the action of the sodium hydroxide of the arsenite solution, or to methyl hydrogen sulphate and methyl alcohol by the action of water; some methyl sulphate is lost also as methyl ether. (2) The disodium methyl arsenite is converted to methyl arsenoxide by treatment with sulphur dioxide: $\text{Na}_2(\text{CH}_3)_2\text{AsO}_3 + \text{SO}_2 = \text{CH}_3\text{AsO} + \text{Na}_2\text{SO}_3$. The sodium bisulphite formed simultaneously from the excess of sulphur dioxide and the excess of sodium hydroxide present, is decomposed after the reduction by addition of sulphuric acid; otherwise the sulphur dioxide would be liberated during the final stage of the process and would then carry off a large part of the final product. (3) The methyl arsenoxide is converted into methyldichloroarsine by passing hydrogen chloride through the solution at 70°–85° C.: $\text{CH}_3\text{AsO} + 2\text{HCl} = \text{CH}_3\text{AsCl}_2 + \text{H}_2\text{O}$. The hydrogen chloride is added until the concentration of the excess hydrochloric acid is about 20%, this giving a mixture of constant boiling point distilling unchanged and tending to prevent reversal of reaction (3); in adding hydrogen chloride the temperature must be kept above 85° C. at the end in order to prevent formation of arsenic trichloride. On distillation, a lower layer of methyldichloroarsine and an upper one of constant boiling hydrochloric acid are obtained; these are separated and any of the product dissolved in the acid layer salted out with saturated calcium chloride solution. The methyldichloroarsine is finally freed from water, methyl alcohol, and hydrogen chloride by distillation. The details of small scale manufacture are described. A yield of nearly 50% of the theoretical

quantity of methylchloroarsine was obtained. The arsenic in methylchloroarsine may be determined by mixing 5 c.c. of the product with 200 c.c. of water, neutralising towards litmus by means of hydrochloric acid, adding excess of sodium bicarbonate and starch, and titrating in the cold with a *N*/10 solution of iodine in potassium iodide.

—T. H. P.

Allyl alcohol [*Determination of* —]. M. J. Stritar. *Monatsh. Chem.*, 1918, **39**, 617—626.

BROMINE is quantitatively absorbed by allyl alcohol; the reaction is suitable for the estimation of allyl alcohol, which may be effected either by direct titration with bromine water until a permanent yellow coloration is observed, or by treating the acidified aqueous solution of the alcohol with an excess of bromide-bromate solution, followed by addition of potassium iodide and titration of the liberated iodine with thiosulphate. (See also *J. Chem. Soc.*, 1919, i., 118.)—H. W.

Hydrocarbons; Influence of catalysts on the chlorination of —. V. R. Kokatnur. *J. Amer. Chem. Soc.*, 1919, **41**, 120—125.

THE influence of various catalysts was studied in the action of chlorine on acetylene tetrachloride, with the object of preparing pentachloroethane. Vegetable charcoal, animal charcoal, and metallic iron respectively were suspended in the liquid and chlorine was passed through at various temperatures. In all cases the reaction products contained no pentachloroethane but only hexachloroethane and unchanged acetylene tetrachloride. Attempts to chlorinate by means of bleaching powder and by heating with anhydrous aluminium chloride also yielded only hexachloroethane, although some of the acetylene tetrachloride was converted into the isomeric unsymmetrical tetrachloroethane.

—J. F. B.

[*Organic*] *acids; Identification of* —. IV. *Phenylacetyl esters*. J. B. Rather and E. E. Reid. *J. Amer. Chem. Soc.*, 1919, **41**, 75—83.

It was previously shown (this *J.*, 1917, 236) that many organic acids can be identified by means of their nitrobenzyl esters, and it is now found that the phenacyl esters may be employed for a similar purpose. Phenylacetyl bromide is easily prepared by treating 20 grms. of acetophenone, dissolved in 30 grms. of glacial acetic acid, with 23 grms. of bromine, which is slowly added with constant shaking and occasional gentle warming when necessary. The sodium salt of the acid is dissolved in a little water (0.05 gm.-mol. in 5 c.c. of water), 1 gm. of phenylacetyl bromide is added and then 10 c.c. of 95% alcohol. The mixture is boiled under a reflux condenser for one hour for monobasic, 2 hours for dibasic, and 3 hours for tribasic acids. If the ester separates during the heating, more alcohol is added. The product is recrystallised until the melting point is constant. The esters of a large number of organic acids have been prepared and characterised and phenylacetyl bromide is recommended as a convenient and useful reagent for the identification of acids, superior in some cases to *p*-nitrobenzyl bromide. Phenylacetyl lactate, m.p. 96° C., is especially interesting, since lactic acid is not easily identified by other means. Sulphonic acids, however, do not give derivatives with either reagent. (See also *J. Chem. Soc.*, Apr., 1919.)—J. F. B.

PATENTS.

Organic acids; Manufacture of —. H. Tobler, Hackensack, N.J., Assignor to Citro Chemical Co., Maywood, N.J. U.S. Pat. 1,288,293, 17.12.18. Appl., 9.11.17.

THE impure calcium salt of an organic acid, such as citric acid, can be purified by treatment with

an alkali bisulphate; the resulting solution of the acid is then neutralised with lime in the presence of sufficient calcium sulphate to complete the precipitation of the calcium salt, whilst the impurities remain dissolved.—D. F. T.

Glycerol. U.S. Pat. 1,288,338. See XVIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic papers; Bubble formation in —. R. E. Liesegang. *Kolloid-Zelts.*, 1918, **23**, 200—202.

PHOTOGRAPHIC papers often exhibit bubbles in the gelatin during development and fixation. These bubbles are sometimes filled with solution and sometimes with air, but in both cases their origin is osmotic. The air comes from the paper where it was originally present and is driven between the paper and gelatin layer by osmotic processes.

—J. F. S.

Quinocyanins (pinacyanols, dicyanins). O. Fischer. *J. prakt. Chem.*, 1918, **98**, 204—232.

CONSIDERABLE light is thrown on the conditions of formation of the blue cyanins used as sensitizers in photography which have been put on the market under the names pinacyanol chloride, dicyanin bromide, and ψ -dicyanin iodide. For the production of pinacyanols and of their homologues, the ψ -dicyanin obtained from 2.4-di- and 2.4.6-trimethylquinoline alkyl iodides, two quinoline molecules are necessary, each containing a methyl group in position 2, by means of which the two molecules are united together. For the production of dicyanins two quinoline molecules are necessary, one containing a methyl group in position 2 and the other a methyl group in position 4. The presence of formaldehyde claimed in Ger. Pat. 172,118 (Eng. Pat. 16,227 of 1905; this *J.*, 1906, 368) is unnecessary provided air or other oxidising agent is present. (See also *J. Chem. Soc.*, Apr., 1919.)

—C. S.

[*Photographic*] *developer sludge; The nature of* —. J. I. Crabtree. Communication No. 62 from the Eastman Kodak Research Lab. *J. Franklin Inst.*, 1918, **186**, 371—372.

A SLUDGE occurring in a deep developer tank in which a "pyro" developer had been used was found to consist chiefly of needle-shaped crystals of hydrated calcium sulphite, $\text{CaSO}_3 \cdot 2\text{H}_2\text{O}$. This forms on standing in solutions of sulphite or bisulphite containing as little as 0.025% of calcium sulphate or chloride. In the particular case examined the calcium salt was introduced with the water used in making the developer, and not as an impurity in the salts used. The sludge has no deleterious effect on the developer apart from a slight reduction of the sulphite content, and the possibility, if it is stirred up, of fine crystals settling on the surface of the plate or film and forming pinholes.—B. V. S.

Photoelectric sensitivity of bismuthinite and various other substances. W. W. Coblenz. Scientific Paper No. 322, U.S. Bureau of Standards. *J. Franklin Inst.*, 1918, **186**, 512.

PURE gallium and silver sulphide show slight photoelectric activity when charged to a negative potential and exposed to light. Exposure to light causes no change in the electric conductivity of tellurium, boelite, pyrites, silicon, and mixtures of

the sulphides of lead and antimony, but increases that of crystals of bismuthinite, cylindrite, molybdenite, selenium, stibnite, boulangierite, jamesonite, and silver sulphide. When connected through a battery to the grid circuit of an audion amplifier and a telephone and exposed to intermittent illumination there is an audible sound in the telephone with crystals or cells of selenium and some samples of bismuthinite and of molybdenite.—B. V. S.

Iron, cobalt and nickel arcs; [Photographic records of] wave lengths in the red and infra-red spectra of —. W. F. Meggers and C. C. Kiess. Scientific Paper No. 324, U.S. Bureau of Standards. J. Franklin Inst., 1918, 186, 513—514.

Using colour-sensitised plates made by bathing in pinacyanol and in dicyanin, and in the first order spectrum from a concave grating of 645 cm. radius of curvature, photographic records of the arc spectra of the ferrous metals were obtained in 10 mins. up to 7000 Å, in 20—30 minutes from 7000 Å to 9000 Å, and over 10,000 Å with 5 to 10 hrs. exposure. For the iron arc 298 lines were measured between the limits 6750 Å and 10,689 Å, for the cobalt arc 606 lines from 5503 Å to 11,623 Å, and for the nickel arc 290 lines from 5504 Å to 10,843 Å. Although the number of lines recorded photographically is several times that recorded radiometrically in regions between these limits where both methods of observation have been used, for longer wave lengths than 10,000 Å the radiometric method is still much the more sensitive.—B. V. S.

PATENTS.

Etched intaglio printing surfaces; Method of producing —. C. W. Saalburg, Richmond Hill, Assignor to Multicolor Intaglio Press Co., New York. U.S. Pat. 1,290,786, 7.1.19. Appl., 27.2.17.

In the production of an intaglio printing surface the resist is formed of two superimposed carbon tissue prints, the lower one being from a half-tone negative, the upper one being a grain-screen print.—B. V. S.

Coloured photographic element and method of making the same. S. E. Sheppard, Assignor to Eastman Kodak Co., Rochester, N.Y. U.S. Pat. 1,290,794, 7.1.19. Appl., 24.5.17.

To a solution of nitrocellulose in amyl acetate is added an alcoholic solution of a dye which "has a molecular affinity for nitro-cellulose" and will not wander from it into gelatin or ordinary photographic solutions. The dyed nitrocellulose is emulsified in a solution of gelatin, the gelatin precipitated by the addition of a suitable electrolyte, the greater part of the amyl acetate removed and the gelatin containing finely divided coloured particles of nitrocellulose again brought into solution. This may be used as a coloured substratum film on a transparent support for a light-sensitive film etc.—B. V. S.

Colour photography. Hess-Ives Corporation, Assignees of F. E. Ives, Philadelphia, Pa., U.S.A. Eng. Pat. 113,618, 19.2.18. (Appl. 20.11.18.) Int. Conv., 20.2.17.

SEE U.S. Pat. 1,278,667 of 1918; this J., 1918, 784 A.

XXII.—EXPLOSIVES; MATCHES.

Chlorate and perchlorate in nitrates. Wogrinz and Kuber. See VII.

Cottonseed fibres. De Segundo. See XII.

PATENTS.

Smokeless powder; Method of drying — and recovering solvents therefrom. L. Gathmann, Washington, D.C. U.S. Pat. 1,289,150, 31.12.18. Appl., 17.2.17.

SMOKELESS powder is dried in a chamber by means of a current of gas which passes in a closed circuit from the chamber to a condenser, and thence through a heating device back into the chamber. The temperature in the condenser is gradually raised as the drying proceeds, so that smaller amounts of solvent are condensed at the later stages of the operation.—C. A. M.

Match. L. V. Aronson, Newark, N.J. U.S. Pat. 1,287,819, 17.12.18. Appl., 9.3.18.

A "PERSISTENTLY combustible" match-head, ignitable by friction, contains a small proportion of potassium salts containing oxygen (e.g. 1 part of potassium chlorate and 2 parts of potassium nitrate) with a relatively large proportion of phosphorus mixed with about an equal proportion of lumpblack, or other non-glowing material (60 parts each), together with a suitable binding agent (e.g. 20 parts of dextrin). The whole is coated with a waterproofing composition.—C. A. M.

Match composition and process of producing the same. W. A. Fairburn, Short Hills, N.J., and F. V. D. Cruser, Oswego, N.Y., Assignors to The Diamond Match Co., Chicago, Ill. U.S. Pat. 1,290,146, 7.1.19. Appl., 28.9.15.

The composition consists of barium chromate, potassium chlorate, sulphur, inert matter, and a binder, the amount of barium chromate being about double that of the potassium chlorate. Barium chlorate, barium hydroxide, and potassium bichromate in molecular proportions are mixed with the other ingredients made into a paste with water.—T. St.

Fertilising. U.S. Pat. 1,289,565. See XVI.

XXIII.—ANALYSIS.

Apparatus; Laboratory —. H. Vigreux. Ann. Falsif., 1918, 11, 385—387.

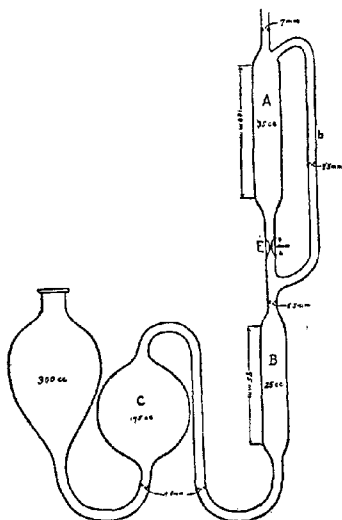
A FRACTIONATING column for use in ammonia distillations consists of a glass tube provided inside with projections arranged in rings; alternate rings consist of projections inclined downwards towards the centre of the tube and of horizontal projections. The upper end of the column is fused into the side of a condenser inclined slightly to the horizontal; at the junction the condensing tube is enlarged to a bulb provided with numerous projections to increase its surface. The greater part of the steam passing up the column is condensed and flows back into the flask, whilst the ammonia vapours pass into an absorption apparatus. A safety-valve for use with water pumps to prevent back-flow of water consists of a float fitted in a chamber; if water enters the lower part of the chamber (this part is connected with the water pump) the float rises and closes the tube in the upper part leading to the vessel to be exhausted. A side-tube and tap are provided for admitting air to the apparatus when required. A condenser is also described in which a large number of cross tubes are provided in the inner condenser tube; the water in the jacket has a free passage through these cross tubes.—W. P. S.

Reflux condenser. J. J. Bajda. J. Ind. Eng. Chem., 1919, 11, 52.

In the type of condenser described the vapours are led directly to the top of the condenser jacket by means of an external side tube extending from the stem of the condenser just above the neck of the distilling flask. The upper end of the side tube enters the top of the jacket and forms a spiral inside the jacket; the lower end of this spiral is provided with a siphon-trap which discharges the condensed liquid through a tube extending down the stem of the condenser. A branch vertical tube extends from just above the siphon-trap axially through the spiral and through the top of the jacket.—W. P. S.

Pipettes; Absorption ——. E. Van Alstine. J. Ind. Eng. Chem., 1919, 11, 51—52.

A CARBON dioxide absorption pipette in which absorption is rapid and shaking is unnecessary is shown in the figure. When the bulbs A and B have been filled with the solution, the gas under examination is admitted from the measuring



burette into the top of A. The outflow of solution from this bulb to the lower one is restricted owing to the constriction, E, of the connecting tube, and the gas passes through the side tube, b, into the bulbs B and C. The solution flows for some time from A and comes into contact with the gas in B, a portion of the gas at the same time bubbling through the solution into C.—W. P. S.

Fat extraction apparatus. E. Griffiths-Jones. Analyst, 1919, 44, 45—47.

The lower end of the tube of a vertical condenser is fitted with two corks; the upper and larger cork serves for attaching the extraction flask to the condenser, and an extraction thimble, containing the substance to be extracted, is fitted to the lower cork. A side tube also passes through the larger cork and extends upwards to the top of the condenser and then down the condenser tube to approximately the level of the water intake. The vapours from the solvent contained in the flask pass up this side tube, and are condensed in the portion of the tube reaching inside the condenser tube, and the condensed liquid falls into the thimble and so returns to the flask. (See also J. Chem. Soc., Apr., 1919.)—W. P. S.

Crucibles made of alloys of platinum and of gold; Action of alkalis on —. P. Nicolardot and C. Chatelot. Bull. Soc. Chim., 1919, 25, 4—9.

New platinum crucibles are more resistant than old ones to the corrosive action of fused sodium or potassium hydroxides, and the presence of iridium diminishes somewhat the resistance of the platinum to the corrosive action of the alkalis. Of the gold alloys studied, those of gold with palladium were the most resistant, but even these were very seriously attacked by sodium peroxide at the concentration necessary for the decomposition of such minerals as chromite. Barium oxide at 825° C. is less corrosive than the fused alkali hydroxides.

—W. G.

Calorimeter efficiency; Some points regarding —. W. P. White. J. Franklin Inst., 1918, 186, 279—287.

The errors in calorimetry of moderately high precision, as practised commercially, are classified as errors due to (1) the main temperature measurement, (2) the value taken for the heat capacity of the calorimetric body, (3) the associated determinations, and (4) thermal leakage. The thermoelectric thermometer is regarded as most suitable in order to reduce errors of temperature measurement. Errors due to (2) are reduced by calibration of the calorimeter either electrically or by means of a standard substance. Under (3) are included errors due to sampling etc. Factors determining thermal leakage are the external and calorimetric temperatures, heat due to stirring, evaporation, and thermal lag. The temperature change of the calorimeter due to leakage in 5 minutes should be less than 0.015 of the difference between the calorimetric and external temperatures. Stirring should be vigorous enough to heat the calorimeter 0.001° per minute. Evaporation should be prevented, and this result can be achieved by covering the calorimeter with a thin metal cover. Precision is secured by uniformity of conditions. Adiabatic calorimeters have the advantage of ease of calculation, but not of precision. (See also this J., 1918, 257 A; 1919, 92 A.)—J. S. G. T.

Gravimetric analysis. Estimation of calcium in the presence of phosphoric, arsenic, and boric acids. L. W. Winkler. Z. angew. Chem., 1919, 32, 24.

CALCIUM is precipitated quantitatively as oxalate in solutions containing phosphoric, arsenic, and boric acids provided the solution is hot and acetic acid and ammonium chloride are present. About 50 c.c. of solution, containing not more than 0.1 gm. of calcium, is made slightly alkaline by the addition of ammonia. The solution is diluted to 100 c.c., 3 grms. of ammonium chloride is dissolved therein, 10 c.c. of N/1 acetic acid is added, and the calcium precipitated as oxalate. The last traces of precipitate may be removed from the beaker by means of a little pure methyl or ethyl alcohol. If a considerable proportion of arsenic or phosphoric acid is present a double precipitation is desirable, the first precipitate being allowed to stand overnight, filtered, washed with ammonium oxalate solution, ignited, the residue dissolved in hydrochloric acid, and the calcium oxalate re-precipitated as before.—A. B. S.

Ring reactions; Phenomenon of —. F. Reiss and G. Diesselhorst. Chem.-Zeit., 1919, 43, 39.

THE formation of a ring, as distinct from a zone, which characterises certain reactions, notably the diphenylamine test for nitrates, is shown to be due to adhesion between the liquid and the glass wall

of the test-tube. The greater the surface of contact between the liquid and the glass, the more sensitive is the ring and subsequent zone reaction.—C. A. M.

Zirconium; Estimation of —. P. Nicolardot and A. Reglade. *Comptes rend.*, 1919, 168, 348–351.

ZIRCONIUM is quantitatively precipitated by ammonium phosphate from solutions, which are either neutral or contain up to 20% of sulphuric acid. The precipitate is calcined, ignited, and weighed as the pyrophosphate, the factor for conversion to ZrO_2 being 0.487. The method may be used for the estimation of zirconium in the presence of iron, chromium, and aluminium, but an acidity equal to 20% sulphuric acid is necessary if the first two are present, or 10% if only aluminium is present, in order to prevent simultaneous partial precipitation of these metals.—W. G.

Lignified plant membranes; New method of selective coloration of —. P. Bugnon. *Comptes rend.*, 1919, 168, 62–64.

THE author recommends the use of Light Green F.S. (sodium diethylidibenzylidiaminotriphenylcarbinol-sulphonate) under the following conditions. The sections are first treated with sodium hypochlorite to destroy the cell contents, then washed and immersed for 12 mins. in a saturated aqueous or alcoholic solution of the stain, containing 5% of hydrochloric or acetic acid, and finally washed in water. The coloration obtained is permanent and preparations may be made in the usual way. This stain may be used in conjunction with Soudan III. in 70% alcohol, by which means the lignified membranes are coloured green and the suberised and cutinised membranes are stained orange-red. As a second dye, in the place of Soudan III., for the selective coloration of the suberised and cutinised membranes, ammoniacal Gentian Violet may be used, and for the coloration of the pectocellulose membranes, Alum Carmine, "Hemalum," lead bichromate, ammoniacal Congo Red, or ammoniacal Benzoazurin may be used in conjunction with Light Green. Finally from these dyes, by using colours which contrast sufficiently, a whole series of triple colorations may be obtained.—W. G.

Permeability of balloon fabrics. Edwards. See V.

Paper tearing-resistance tester. Case. See V.

Sulphur in pyrites. Moore. See VII.

Sulphide sulphur in pyrites. Bartsch. See VII.

Chlorate and perchlorate in nitrates. Wogrinz and Kuber. See VII.

Calcium oxide in lime. Meiklejohn. See VII.

Air in plastic clay. Spurrier. See VIII.

Iron in iron ores. Schwarz and Rolfes. See X.

Phosphorus in vanadium steels etc. Johnson. See X.

Cadmium [in brass]. Schramm. See X.

Soaps containing clay. Bodinus. See XII.

Melting point of rosin. Crossley. See XIII.

Flocculating power of soil solution. Leoncini and Masoni. See XVI.

Phosphatic fertilisers. Masoni and others. See XVI.

Fehling's sugar test. Fischer and Hooker. See XVII.

Soluble starch. Small. See XVII.

Water in milk. Harris. See XIXA.

Digestibility of vegetable fibres. Waentig and Gierisch. See XIXA.

Morphine. Annett and Singh. See XX.

Determination of morphine. Von Friedrichs. See XX.

Alkaloid of Isopyrum thalictroides. Mirande. See XX.

Stovaine and cocaine. Denigès. See XX.

Methyldichloroarsine. Uhlinger and Cook. See XX.

Allyl alcohol. Stritar. See XX.

Saccharin in tablets. Bonis. See XX.

Identification of organic acids. Rather and Reid. See XX.

PATENTS.

Photometer. A. P. Little, Washington, D.C. U.S. Pat. 1,288,067, 17.12.18. Appl., 8.9.17.

A STANDARD comparison screen is enclosed by a casing the walls of which carry a self-luminous material. Another screen is illuminated by the light, of which the intensity is to be measured, and means are provided to vary and to indicate that intensity.—W. F. F.

Thermo-couple and method of constructing the same. L. W. Chubb, Pittsburgh, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,289,116, 31.12.18. Appl., 10.2.14.

TWO thin flat strips of dissimilar metals are connected together at one end, and arranged one over the other with strips of insulating material, e.g., impregnated paper, between and on each side of them, so as to make a relatively thin flexible element.—W. F. F.

Calorimeters; Combustion-pan for bomb —. V. H. M. Roehrich, St. Paul, Minn. U.S. Pat. 1,289,918, 31.12.18. Appl., 27.7.14. Renewed 3.4.16.

THE combustion-pan of a bomb calorimeter is provided with a short channel extending from it and containing a small quantity of the material which is to be burnt in the pan. The electrical igniting device is applied to the material in the channel and the ignition extends to the main body of

material in the pan so that the combustion of this material does not injure the igniting device.

—W. F. F.

Liquids; Apparatus for determining the specific gravity of — A. T. Hassinger, Chicago, Ill. U.S. Pat. 1,290,553, 7.1.19. Appl., 13.10.17.

A VESSEL calibrated to indicate volume is provided with a flexible bottom and with a thermometer. The volume of the vessel is varied by a setscrew, acting on the flexible bottom to distort it, and provided with a graduated head calibrated to compensate for temperature variations. The vessel may thus be filled with liquid to a volume corresponding to a standard temperature, and the specific gravity determined from the weight of liquid.—W. F. F.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Aktiebolaget Svenska Kullagerfabriken. Furnaces. 5390. Mar. 4. (Sweden, 4.3.18.)
Barnes. Hydro-extractors. 6361. Mar. 14.
Benjamin. Tunnel kilns. 5005—5008. Mar. 6.
Bernitz. Furnace walls. 6184. Mar. 12.
Brand. 6053. See II.
Brian. Vertical drying kiln. 5121. Mar. 1.
Chaudière. Shaft furnaces. 5220. Mar. 3.
Chemical Equipment Co. Corrosive-fluid valves. 6330. Mar. 13. (U.S., 13.3.18.)
Cowburn, and Cowburn and Cowpar. Carboy hampers or crates. 5643, 5644. Mar. 7.
Crompton and Gallagher. Apparatus for calculating thermal efficiency etc. of steam-generating plant. 5528. Mar. 6.
Forsyth. Grinding or pulverising ores, clinker, etc. 6329. Mar. 13.
Gay. Arrangement of plates for absorption, reaction, distillation, and rectification columns, etc. 5730. Mar. 7.
Giovannoni. Filters. 5054. Feb. 28. (Italy, 22.5.18.)
Greco. Refractory brick-work for water-tube boilers. 6494. Mar. 15.
Helmer. Separating-devices. 5044. Feb. 28. (U.S., 25.4.18.)
Hodges and Kent. Combined washing-machine and hydro-extractor. 6031. Mar. 11.
Holehouse. Towers etc. for cooling water etc. 5637. Mar. 7.
Irwin. Degreasing-plant. 5327. Mar. 4.
Kirke. Waste-heat boilers etc. 6008. Mar. 11.
Laverack. Apparatus for drying excreta, mucilaginous matters, etc. 5975. Mar. 11.
Lessing. Rings for absorption towers, distillation columns, etc. 4967. Feb. 27.
Lewis. Appliances for effecting heat transference between gases, vapours, or liquids. 6182. Mar. 12.
Mugrove. 5419. See VIII.
Newbery and Sturgeon. Separation of liquids. 4517. Feb. 24.
Pfenniger. Heat-storing and water-evaporating plants. 6320. Mar. 13.
Ransome-ver-Mehr Machinery Co., and Webb. Mixing machines. 6096. Mar. 11.
Roberts. 5748. See VIII.
Roberts. Grinding-mills. 6337. Mar. 13.

Sadler and Sadler. Filter strainer. 6505. Mar. 15.
Savy. Drying-apparatus. 4856. Feb. 26. (France, 30.11.16.)
Smallwood. Furnaces. 4913. 5953. Feb. 27 and Mar. 11.
Smith. Roller grinding and crushing mills for pigments etc. 5414. Mar. 5.
Smith and Zulver. Furnaces. 4589. Feb. 24.
Soc. du Four Vertical Continu. Producing regular progression of materials in vertical ovens. 5251. Mar. 3. (France, 1.3.18.)
Tullis. Drying articles. 6175. Mar. 12.
Van Norman. Grinding machines. 4959. Feb. 27.

COMPLETE SPECIFICATIONS ACCEPTED.

24,296 (1914). Marks (Du Pont de Nemours Powder Co.). Removal of liquids from solid materials soluble therein. Mar. 12.
16,878 (1916). Hinchley and Gorton. Processes and apparatus for expressing liquid from material containing the same. (123,774.) Mar. 19.
10,862 (1917). Bernard and Vibert. Apparatus for sorting material. (108,325.) Mar. 12.
2438 (1918). Sturgeon. Centrifugal machines or separators. (123,797.) Mar. 19.
2737 (1918). Thompson and Brown. Heat-exchangers for used as feed-water heaters, evaporators, condensers, coolers, and the like, but more particularly as heaters for use in oil fuel installations. (123,369.) Mar. 5.
3340 (1918). Watterson. Method of and apparatus for arresting sparks and economising fuel in furnaces. (123,575.) Mar. 12.
3516 (1918). British Dyes, Ltd., Turner, and Parker. Filter press. (123,589.) Mar. 12.
4041 (1918). Turrettini. Apparatus for heating liquids by the heat generated by chemical reactions. (117,601.) Mar. 12.
4196 (1918). Talbot. See XIX.
4237 (1918). Blyth and Miles. See III.
4738 (1918). Searle. Distillation of solid and liquid substances. (123,616.) Mar. 12.
4805 (1918). Masters, and Gibbons Bros. See II.
5029 (1918). Brownell. Apparatus for drying and similarly treating materials. (114,626.) Mar. 5.
5651 (1918). Marles, and Ransome & Marles Bearing Co. Grinding-machines. (123,866.) Mar. 19.
6597 (1918). Simon, Hinchley, and Fisher Chemical Engineering Co. Construction of apparatus for extracting oils, fats, grease, wax, indiarubber, sulphur and other substances, soluble in organic solvents, from materials containing the same. (123,645.) Mar. 12.
6612 (1918). Alexander. Apparatus or kilns for drying granular, pulverulent, and pasty materials. (123,646.) Mar. 12.
7734 (1918). Grondal. Mechanical feeding furnace. (115,640.) Mar. 19.
11,905 (1918). Soc. de Moteurs à Gaz et d'Industrie Mécanique. Vapour condensers. (117,814.) Mar. 19.
13,200 (1918). Hofmann. Apparatus for drying goods in bulk. (123,923.) Mar. 19.
13,741 (1918). Brown (Bangkok Dock Co.). Devices for the removal of ash, dust, and like matter from gases and the like. (123,924.) Mar. 19.
17,293 (1918). Pinkney. Mixing-machines. (120,393.) Mar. 5.
20,605 (1918). Kettle. Apparatus for the electrical protection against corrosion, pitting, and the like, of the tubes, ferrules, doors, and other parts of surface condensers and the like. (123,961.) Mar. 19.
21,553 (1918). Hardinge. Grinding-mills. (123,705.) Mar. 12.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Aish. Incandescent electric lamps. 6237. Mar. 13.
 Appleby and Bentley. Apparatus for agitating fuel in gas-generators etc. 6336. Mar. 13.
 Bates and Bates. 6251. 6252. *See* VII.
 Berk and Co., and Hood. Purification of coal gas. 5079. Feb. 28.
 Box. Incandescent gas-lighting. 5963. Mar. 11.
 Brand. Apparatus for firing furnaces with powdered fuel. 6053. Mar. 11.
 Caracristi and Muhlfeld. Burning pulverised fuel. 4544. Feb. 24.
 Cash. Briquette fuel. 5296. Mar. 4.
 Corrigan. Incandescent electric lamps etc. 5679. Mar. 7.
 Cummins. Vertical gas-retorts. 5002. Feb. 28.
 Cummins and Tooley. Horizontal gas-retorts. 5112. Mar. 1.
 Cuthbertson and Greensmith. Apparatus for quenching and transporting coke from coke-ovens. 5209. Mar. 3.
 Dibdin. Revivifying spent oxide. 6523. Mar. 15.
 Dunham. Burning combustible gases. 5064. Mar. 7. (U.S., 10,438.)
 Hood. Purification of petroleum oils. 4576. Feb. 24.
 Hood. Recovery of cyanogen from coal gas. 6445. Mar. 14.
 Hookham. Incandescent electric lamps. 5819. Mar. 8.
 Keillar. 5039. *See* VIII.
 Knowles. Composition for treating coal. 5841. Mar. 10.
 Macdonald and Macdonald. Method of making hydrocarbon gas. 5814. Mar. 8.
 McLeod. Apparatus for carbonisation and distillation of moist carbonaceous materials. 6426. Mar. 14.
 Mancini and Mancini. Explosive mixtures for internal-combustion etc. engines. 5241. Mar. 3. (Italy, 26,818.)
 Mathy. Apparatus for heating by combustion without flame. 4855. Feb. 26.
 Nerrière. Apparatus for extracting coke from coke-ovens. 4604. Feb. 24. (France, 28,318.)
 Pearse (Kennedy). Rotary retorts, and destructive distillation of carbonaceous material therein. 6057. Mar. 11.
 Rideal and Tarrant. 5904. *See* XXIII.
 Rogerson. Coal-washing plant. 5286. Mar. 4.
 Shedlock. Treatment of hydrocarbons for extraction of volatiles and conversion into liquids of different specific gravities etc. 5237. Mar. 4.
 Sloan. Process for utilisation of peat, brown coal, straw, moss, coal, cellulose, carbonaceous material, natural bitumen, and hydrocarbons either in combination or separately. 6135. Mar. 12.
 Soc. du Four Vertical Continu. 5251. *See* I.
 Testrup. Combustion. 6514. Mar. 15.
 Walker. Heating bitumen asphalt, tar, etc. 6238. Mar. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

- 10,981 (1915). Robertson, Nelson, and Petrol Patents, Ltd. Treatment of hydrocarbon oils and residues for the production of lower-boiling hydrocarbons. Mar. 19.
 7956 (1917). Croft, Carr, and Nairne. Method of and means for treatment of gas-liquor. (123,337.) Mar. 5.
 2737 (1918). Thompson and Brown. *See* I.
 3240 (1918). Firth, Blakeley, Sons, and Co., and Shaw. Arrangement and operation of vertical gas retorts. (123,408.) Mar. 5.

- 3340 (1918). Watterson. *See* I.
 3521 (1918). Day. Extraction of hydrocarbon products from shales and coals. (123,415.) Mar. 5.
 4738 (1918). Searle. *See* I.
 4805 (1918). Masters, and Gibbons Bros. Method of and means for feeding the furnaces of gas retorts, settings, coke ovens, muffles, and the like. (123,617.) Mar. 12.
 5559 (1918). Warburton. Method of drying peat turves. (123,637.) Mar. 12.
 5692 (1918). Ten Bosch. Method of and means for removing water from peat. (123,517.) Mar. 12.
 5788 (1918). West and Wild. Charging of retorts or chambers for the destructive distillation of carbonaceous materials. (123,441.) Mar. 5.
 6598 (1918). Dent, and United Alkali Co. Apparatus for use in the distribution of liquids in gas scrubbers and for analogous purposes. (123,879.) Mar. 19.
 6772 (1918). Marks (Fayd'herbe). Fuels for internal-combustion engines. (123,450.) Mar. 5.
 19,066 (1918). Aktiebolaget Ingeniörsfirma Egnell. *See* XXIII.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

- Imrie (Gelgy Soc. Anon.). Process of manufacture of 2-aminoanthraquinone. 5930. Mar. 10.
 Mailhe. Process for production of aminophenol bases. 6094. Mar. 11. (France, 21,417.)
 Shedlock. 5337. *See* II.
 Walker. 6238. *See* II.

COMPLETE SPECIFICATIONS ACCEPTED.

- 10,981 (1915). Robertson and others. *See* II.
 15,320 (1917). Selden Co., and Gibbs. Process of chlorinating the side chains of aromatic hydrocarbons. (123,341.) Mar. 5.
 1004 (1918). Hintikka. Manufacture of paranitrotolueneortho-sulphonic acid. (123,548.) Mar. 12.
 4237 (1918). Blyth and Miles. Means of and apparatus for purifying benzol and other oils, and washing or mixing two liquids of different specific gravity. (123,839.) Mar. 19.
 5080 (1918). Crabb. Methods and apparatus for separating and purifying creosote oil. (123,857.) Mar. 19.
 6667 (1918). Archer. Tar stills. (123,880.) Mar. 19.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

- Brotherton and Co., Ehrhardt, and Kay. Manufacture of black sulphur colours. 6242. Mar. 13.
 Brotherton and Co., Ehrhardt, and Ehrhardt. Manufacture of violet colouring-matters dyeing by the metachrome process. 6243. Mar. 13.

COMPLETE SPECIFICATION ACCEPTED.

- 9962 (1915). Badier and Holliday. *See* XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

- Aktieselskabet Frogner Garage Motor Co. Frogga-Mo. Method of impregnating balloons etc. 6499. Mar. 15. (Norway, 29,518.)
 Barefoot. Compound for removal of iron mould etc. from textile goods etc. 5957. Mar. 11.
 Barnes. 6361. *See* I.
 Barnes and Sinnatt. 5974. *See* XXIII.
 Hodges and Kent. 6031. *See* I.
 Irwin. 5327. *See* I.

Johnson. Paper-making etc. machines. 6229. Mar. 13.
 Kirschbraun. Waterproof products and processes. 5596. Mar. 6.
 Kloss. Waterproof material. 5885. Mar. 10.
 Nash. Continuous beating and refining engine for manufacture of paper etc. 5479. Mar. 5.
 Poulson. Treatment of wool. 5297. Mar. 4.
 Schiller. Paper-making machines. 5946. Mar. 10.
 Thornber. Composition for rendering wearing-apparel non-inflammable. 4660. Feb. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

5915 (1915). Wheatley, and North British Rubber Co. Fabric for balloon envelopes and the like, and the method of manufacturing and after-treating the same. Mar. 12.
 6698 (1915). Portadown Weaving Co., and Greaves. Fabrics applicable for aeroplane and other purposes and aeroplane wings and planes. Mar. 12.
 17,817 (1917) and 10,567 (1918). Manchester Oxide Co., Clayton, Huebner, and Williams. Process of treating celluloses. (123,784.) Mar. 19.
 1519 (1918). Huebner. Machines or apparatus for coating textile and other fabrics. (123,551.) Mar. 12.
 3474 (1918). Anderson, Anderson, and Wilson. Hollander beating engines. (123,584.) Mar. 12.
 3598 (1918). Dagnall. Process for the manufacture of parchmentised or like paper. (123,594.) Mar. 12.
 4122 (1918). Fry and Whitton. Fabrics. (123,613.) Mar. 12.
 4516 (1918). Kelsey. Process for recovering grease and the like from water which has been used in scouring or washing wool, hides, flax, jute, and the like, or from magma obtained from such water. (123,848.) Mar. 19.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Driver and Sunderland. 5788. *See* XXIII.
 Henshilwood and Wrigley. Finishing fabrics. 5538. Mar. 6.
 Whitaker and Whitaker. Machines for dyeing, scouring, and washing wool etc. 6362. Mar. 13.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Bates and Bates. Means for producing spathic ore for manufacture of hydrogen. 6251. Mar. 13.
 Bates and Bates. Means for charging retorts or apparatus with spathic ore for manufacture of hydrogen. 6252. Mar. 13.
 Breuille. 5134. *See* X.
 British Thomson-Houston Co. (General Electric Co.). Fractionating air. 6438. Mar. 14.
 Comment. Process for preparation of anhydrous sulphide of zinc. 6089. Mar. 11. (France, 30.4.18.)
 Dibdin. 6523. *See* II.
 Fairbrother (Chemical Construction Co.). Apparatus for recovering potassium compounds. 4562. Feb. 24.
 Fairbrother (Chemical Construction Co.). Process of recovering potassium compounds. 4563. Feb. 24.

Gibbs. Manufacture of inorganic chlorine compounds. 5737. Mar. 7.

Gros et Bouchardy. Production of nitrogen compounds containing hydrogen with aid of electric discharges. 4900. Feb. 24. (Switz., 2.10.18.)
 Hood. 6445. *See* II.
 Lindsay Light Co. Process of purifying thorium compounds. 6456. Mar. 14. (U.S., 29.5.18.)
 Orton and Robinson. Manufacture of alumina. 4827. Feb. 26.

Rideal and Tarrant. 5904. *See* XXIII.
 Soc. l'Air Liquide. Transformation of synthetic ammonia into a transportable product for use in agriculture in conjunction with production of carbonate of soda. 6448. Mar. 14. (France, 24.8.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

6048 (1915). Gidden. Manufacture of ammonium nitrate. Mar. 12.
 10,595 (1915) and 1059 (1916). Smith, and Ammonia Soda Co. Process for the production of calcium nitrate. Mar. 19.
 10,781 (1915). Maxted and Ridsdale. Production of oxides of nitrogen. Mar. 19.
 12,401 (1915). Freeth and Cocksedge. Manufacture of ammonium nitrate from ammonium bicarbonate or the components thereof and sodium nitrate. Mar. 19.
 7956 (1917). Croft and others. *See* II.
 16,692 (1917). Dawson. Manufacture of nitric acid. (123,344.) Mar. 5.
 1467 (1918). Soc. Industrielle de Produits Chimiques. Process for transforming sodium monochromate into bichromate. (119,219.) Mar. 12.
 2386 (1918). Carlson. Manufacture of nitrogen compounds from carbides. (123,796.) Mar. 19.
 6111 (1918). Titan Co. Aktieselskab. Titanium products. (116,286.) Mar. 12.
 6597 (1918). Simon and others. *See* I.
 8072 (1918). Barrett and Pennington. Method of and apparatus for the manufacture of carbonic acid gas. (123,898.) Mar. 19.
 11,020 (1918). Bracy. Pyrites furnaces. (118,094.) Mar. 5.
 11,369 (1918). Patentaktiebolaget Jungners Kali-Cement. *See* IX.
 12,001 (1918). Norsk Hydro-Elektrisk Kvaestofaktieselskab. Production of alumina nitrates from clay, argillite, and similar minerals. (120,035.) Mar. 12.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Bairstow. Brick composition, and articles manufactured therefrom. 4565. Feb. 24.
 Barratt. Manufacture of glass tube. 4905. Feb. 27.
 Benjamin. 5605-5608. *See* I.
 British Thomson-Houston Co. (General Electric Co.). Porcelain. 6393. Mar. 13.
 Denis. Manufacture of refractories. 5441. Mar. 5.
 Gowen (Lecese). Manufacture of refractory materials. 5597. Mar. 6. (France, 25.3.16.)
 Greco. 6494. *See* I.
 Hughes. Method of printing upon glass. 6518. Mar. 15.
 Keillar. Fire-bricks for furnaces, coke-ovens, etc. 5059. Feb. 28.
 McInn. Glazing cement for use in fire-clay retorts and furnaces. 5075. Feb. 28.
 Musgrove. Recuperator brick. 5419. Mar. 5.

Musgrove. Bricks. 6377. Mar. 14.
 Roberts. Blocks, and heating-walls made from such blocks. 5748. Mar. 7.
 Sharratt. Brick kilns. 5347. Mar. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

2254 (1917). Norton Co. Aluminous abrasive, and method of preparing the same. (113,959.) Mar. 19.
 2257 (1917). Norton Co. Aluminous abrasives and process for making the same. (118,592.) Mar. 19.
 2848 (1918). Barron and Barron. Artificial mill-stones and the manufacture thereof. (123,377.) Mar. 5.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Boivie, Shaw, and Stanley. Manufacture of artificial stone. 6355. Mar. 14.
 Bravin. Concrete etc. 5153. Mar. 1.
 Clarke. Manufacturing concrete etc. 4701. Feb. 25.
 De Vecchis. Metallisation of wood. 5208. Mar. 3.
 Forrester (Internationalt Isolations Kompani Aktieselskabet Iksas). 6522. See XI.
 Frydenhind. Production of porous building and insulating bodies. 5358. Mar. 4. (Denmark, 5,318.)
 Hill-Jones, Ltd., and Hughes. Manufacture of bricks, slabs, tiles, etc. for paving, building, etc. 6510. Mar. 15.
 Lovell. Building blocks or bricks. 5824. 5825. Mar. 8.
 Price. Manufacture of faced artificial stone products. 5811. Mar. 8.
 Price. Apparatus for manufacture of artificial stone products. 5812. Mar. 8.

COMPLETE SPECIFICATIONS ACCEPTED.

1040 (1918). Ferguson. Blocks used for building purposes. (123,301.) Mar. 5.
 11,369 (1918). Patentaktiebolaget Jungners Kali-Cement. Method of manufacturing simultaneously hydraulic cement and alkali from alkaliferous mineral substances and lime. (117,460.) Mar. 5.
 15,712 (1918). Olsen and Westell. Process for making waterproof cement and the product thereof. (123,695.) Mar. 12.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Adam, Mabbitt, and Stevenson. Detinning tinned iron scrap. 4838. Feb. 26.
 Alloy Welding Processes, Ltd., and Jones. Electrodes and welding etc. rods used in soldering and depositing metals. 4848. Feb. 26.
 Ashton, and Oates and Green. Acid etc. baths for treating wire. 4665. Feb. 25.
 Ayala. Solder for aluminium, and process for making same. 5381. Mar. 4. (Spain, 10,917.)
 Bell. Separating mineral from crushed ores, ore from alluvial and placer deposits, etc. 5362. Mar. 4.
 Brearley and Johnson. 5374. See XXIII.
 Breuille. Agglomerating and desulphurating blocks composed of ashes of roasted pyrites. 5134. Mar. 1.

Cowper-Coles. Matrix for manufacture of plates by electro-deposition. 5438. Mar. 5.
 Cowper-Coles. Manufacture of copper plates for process printing. 5439. Mar. 5.
 Cowper-Coles. Process for manufacture of wire. 5440. Mar. 5.
 Dear. Oil-hardening steel plates. 5744. Mar. 7.
 Dear. Nickel-steel alloys. 5745. Mar. 7.
 Delves-Broughton. Flux for soldering metals 5521. Mar. 6.
 Dendrinós. Method for protecting iron, steel, etc. from oxidation when heated to a high temperature. 4837. Feb. 26.
 De Vecchis. 5208. See IX.
 Forsyth. 6329. See I.
 Gasche. Concentration of ores. 6392. Mar. 14.
 Hole. Electric smelting-furnaces. 5573. Mar. 6. (Norway, 11,418.)
 Kuehnrich. Alloy. 6276. Mar. 13.
 Meacher. Method of electrically welding platinum etc. disks to ends or heads of metal screws or rods. 4632. Feb. 25.
 Peeks. Pudding-furnaces. 4638. Feb. 25.
 Ross. Obtainment of sulphate of copper, metallic copper, etc., from ores. 5580. Mar. 6.
 Stabilimenti Biak-Ing. A. Pouchain. Electric furnace for heating, annealing, or melting metallic materials. 5331. Mar. 10. (Italy, 9,318.)
 Vautin. Recovery of metals from slags. 6541. Mar. 15.

Wade (Central Mining and Investment Corporation). Electrodes for electrolytic recovery of metals from solutions. 4622. Feb. 24.
 Wade (Central Mining and Investment Corporation). Electrolytic recovery of metals from solutions. 4623. Feb. 24.
 Webster. Method of malleablising cast metal. 6210. Mar. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

12,200 (1917). Hall and Bailey. Furnaces for melting steel and other metals. (123,778.) Mar. 19.
 2213 (1918). Robertson. Device to lessen oxidation while tapping steel from smelting furnace. (123,793.) Mar. 19.
 3505 (1918). Yourieff. Production of spongy lead. (123,537.) Mar. 12.
 3591 (1918). Cito. Process for treating copper sweepings and scraps. (123,418.) Mar. 5.
 7474 (1918). Aitken. Crucible furnaces for melting metals. (123,437.) Mar. 5.
 11,020 (1918). Bracy. See VII.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Adam, Fieldhouse, Mabbitt, and Stevenson. Electrolysis. 4948. Feb. 27.
 Alloy Welding Processes, Ltd., and Jones. 4848. See X.
 British Thomson-Houston Co. (General Electric Co.). Electric-furnace control apparatus. 5465. Mar. 5.
 British Thomson-Houston Co. (General Electric Co.). Electric heating units, and methods of manufacturing same. 6195. Mar. 12.
 Cowper-Coles. 5438. See X.
 Cowper-Coles. Process for production of zinc battery elements. 5783. Mar. 8.
 Dreyfus. Chemical processes conducted in electrical furnaces. 4933. Feb. 27.
 Féry. Electric storage cells. 5706. Mar. 7. (France, 30,417.)

F.I.A.T. Soc. Anon. Electrical furnaces. 5894. Mar. 10. (Italy, 2.11.18.)

Forrester (Internationalt Isolations Kompani Aktieselskabet Ikas). Manufacture of insulating bodies etc. 6522. Mar. 15.

Gros et Bouchardy. 4600. *See* VII.

Hepburn. Electrolysers. 5698. Mar. 7.

Hole. 5573. *See* X.

Marriott. Electric furnaces. 5212. Mar. 3.

Meacher. 4630. *See* X.

Thompson. Manufacture of carbon electrodes. 5764. Mar. 8.

Wade (Central Mining and Investment Corporation). 4622. 4633. *See* X.

Worsnop. Electrical accumulators. 4509. Feb. 24.

COMPLETE SPECIFICATIONS ACCEPTED.

19,041 (1917). Prescott and Baker. Electrical apparatus for subjecting articles to varying temperatures. (123,545.) Mar. 12.

3430 (1918). Yourieff. Electric accumulators and the like. (123,582.) Mar. 12.

4128 (1918). Howard. Control of electric furnaces. (123,845.) Mar. 19.

16,762 (1918). Newbery and Gerrard. Electrodes. (123,936.) Mar. 19.

20,605 (1918). Kettle. *See* I.
2507 (1919). Leitner and Exley. Manufacture of electric accumulators. (123,969.) Mar. 19.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Irwin. 5327. *See* I.

King. Deodorising and decolorising oils and fats. 6059. Mar. 11.

Musgrave. Manufacture of soap. 4762. Feb. 26.

N.V. Jurgens' Vereenigde Fabr. 6142. *See* XIX.

COMPLETE SPECIFICATIONS ACCEPTED.

1856 and 2618 (1918). Boehm and Reihl. *See* XIII.

3613 (1918). Moore and Moore. Cleansing compound or paste for toilet purposes. (123,597.) Mar. 12.

4160 (1918). Douglass. Detergent soaps and means for and method of making same. (123,835.) Mar. 19.

4516 (1918). Kelsey. *See* V.

6597 (1918). Simon and others. *See* I.

11,785 (1918). Napp (Preiswerk). *See* XX.

21,895 (1918). Laue. Apparatus for hydrogenising oils and fats. (123,961.) Mar. 19.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Barnes and Sinnatt. Manufacture of paints, inks, polishes, filling-materials for rubber, paper, artificial leather, etc. 5974. Mar. 11.

Ingram. Antifouling paint. 5567. Mar. 6.

Oltmans. Pliant floor covering. 4960. Feb. 27.

Smith. 5414. *See* I.

COMPLETE SPECIFICATIONS ACCEPTED.

1600 (1918). Craven, and Yorkshire Dyeware and Chemical Co. Linoleum and linoleum cement. (123,791.) Mar. 19.

1856 and 2618 (1918). Boehm and Reihl. Process for converting linseed oil fatty acids or any other

fatty acids of drying or semi-drying oils into well-drying oils. (123,792.) Mar. 19.

3664 (1918). Sperr and Darrin. Manufacture of resins. (123,806.) Mar. 19.

4290 (1918). Morris. Manufacture of chrome yellows. (123,841.) Mar. 19.

5300 (1918). Cellon, Ltd., Tyrer & Co., and Tucker. Production of dopes. (123,628.) Mar. 12.

16,317 (1918). McLean. Washable distemper or water paint. (123,931.) Mar. 19.

16,318 (1918). McLean. Thinning-composition for use with washable distemper or water paint. (123,932.) Mar. 19.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

Barnes and Sinnatt. 5974. *See* XIII.

Bowdler. Treatment or recovery and purification of rubber. 5427. Mar. 5.

Wade (Goodyear Tire and Rubber Co.). Manufacture of rubber compounds. 4551. Feb. 24.

COMPLETE SPECIFICATION ACCEPTED.

6597 (1918). Simon and others. *See* I.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATIONS.

Barnes and Sinnatt. 5974. *See* XIII.

Dufour and Dufour. Tanning and liming hides or skins. 5124. Mar. 1. (Italy, 6.4.18.)

Garner. Apparatus for liming hides. 5671. Mar. 7.

Tully. Preparation for waterproofing leather. 4793. Feb. 26.

COMPLETE SPECIFICATIONS ACCEPTED.

1974 (1917). Goldreich, Jackson, and Stern & Co. Waterproofing, polishing, preserving, and restoring preparations for boots and the like, and for other articles of leather or the like. (123,775.) Mar. 19.

17,879 (1917). Meyzonnier. Process for preparing solutions suitable for chrome tanning. (123,785.) Mar. 19.

4516 (1918). Kelsey. *See* V.

5874 (1918). Giliardini. Apparatus for the rapid tanning of hides and skins. (114,631.) Mar. 12.

6686 (1918). Wright and Wright. Tanning machinery. (123,448.) Mar. 5.

XVI.—SOILS, FERTILISERS.

APPLICATIONS.

Radmann. Fertiliser and method of producing same. 5477. Mar. 5.

Soc. l'Air Liquide. 6448. *See* VII.

Tasker. Fertiliser. 6231. Mar. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

9855 and 20,597 (1918). Goulding, Goulding, and Allibon. Apparatus for the manufacture of superphosphates or like artificial fertilisers. (123,912 and 123,960.) Mar. 19.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

Laverack. 5975. *See* I.

Lenders. Method of manufacturing starch and conversion products thereof. 5512. Mar. 5.

COMPLETE SPECIFICATION ACCEPTED.

13,530 (1918). Pictet. Manufacture of levoglucosan. (121,725.) Mar. 12.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATIONS.

Armitage. Separating yeast etc. in suspension from beer and stout. 5087. Mar. 7.

Rampichini & Co. Processes based on the action of enzymes, and baths, mixtures, etc., containing one or more enzymes. 4571. Feb. 24. (Italy, 23,318.)

Timmermans. Filter for use in breweries etc. 6162. Mar. 12.

COMPLETE SPECIFICATION ACCEPTED.

4845 (1915). Weizmann. Bacterial fermentation of carbohydrates and bacterial cultures for the same. Mar. 12.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Burkhalter. Preparation for making bread, biscuits, etc. 6082. Mar. 11.

Coleman and Jones. Treatment of cereals. 4508. Feb. 24.

Ferguson. Bread-making. 6114. Mar. 12.

Fletcher and Lewis. 5404. See XXIII.

Fothergill and Whyte. Apparatus for treatment of sewage etc. 5028. Feb. 28.

Kelsey. Process for making bread. 5245. Mar. 3.

Laverack. 5975. See I.

Linden. Drying sewage sludge etc. 4740. Feb. 25.

Linden. Reducing percentage of water in sewage sludge etc. 5864. Mar. 10.

Linden. Siphons for reducing percentage of water in sewage sludge etc. 6078. Mar. 11.

Mills. Testing milk etc. for cheese-making. 4704. Feb. 26.

N. V. Jurgens' Vereenigde Fabrieken. Processes for recovering oils and fats from waste water. 6142. Mar. 12. (Holland, 9,318.)

Watson. Furnaces for destruction of refuse etc. 6172. Mar. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

12,861 (1917). Sutherland. Process and apparatus for increasing the yield of bread and improving the baking qualities of flour or meal and milling products. (115,410.) Mar. 5.

3132 (1918). Van Dantzig, and N.V. Chemisch & Pharmaceutisch Laboratorium. Process of preserving vegetables and fruits. (123,403.) Mar. 5.

3523 (1918). Dowding. Treatment of potatoes for obtaining food products. (123,591.) Mar. 12.

3625 (1918). Lyle. Combined food and beverage, and process of making the same. (123,804.) Mar. 19.

4196 (1918). Talbot. Means or apparatus for purifying air. (123,609.) Mar. 12.

4983 (1918). Greville. Treatment of flour. (123,435.) Mar. 5.

6971 (1918). Graham. Bread and other food products and process of producing same. (123,883.) Mar. 19.

8250 (1918). Smithers. Apparatus for use in sterilising and/or pasteurising canned or tinned food. (123,899.) Mar. 19.

13,811 (1918). West. Method of treating grain for the preservation thereof, and apparatus employed in connection therewith. (123,925.) Mar. 19.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATION.

Dunningham, Hargreaves, and Hutchins. Manufacture of tetrachlorethane. 5149. Mar. 1.

COMPLETE SPECIFICATIONS ACCEPTED.

17,776 (1914). Lefranc. Process for the commercial manufacture of acids of the fatty series and of butyric acid in particular. Mar. 12.

15,329 (1917). Selden Co., and Gibbs. See III.

11,785 (1918). Napp (Preiswerk). Process for the manufacture of isobutyl ester of oleic acid. (123,685.) Mar. 12.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATION.

Balchin. Photographic film and production thereof. 5926. Mar. 10.

COMPLETE SPECIFICATIONS ACCEPTED.

17,881 (1917). Hamburger. Polychrome cinematography. (123,786.) Mar. 19.

17,882 (1918). Hamburger. Colour photography. (123,787.) Mar. 19.

XXII.—EXPLOSIVES; MATCHES.

APPLICATIONS.

Gale and Hodgkinson. Utilisation of waste explosives. 6351. Mar. 13.

Johnston and Orr. Process for moisture-proofing matches. 4645. Feb. 25.

Short and Ward. Explosives. 5102. Mar. 1.

Van Cleef. Matches. 4738. Feb. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

2169 and 2172 (1915). Mellersh-Jackson (Palmer Perchlorate Powder Co.). Manufacture of explosives. Mar. 12.

9932 (1915). Badier and Holliday. Process of manufacture of picric acid. Mar. 19.

10,865 (1915). Pronk and Bowen. High explosives. Mar. 19.

XXIII.—ANALYSIS.

APPLICATIONS.

Brearley and Johnson. Measuring-apparatus for testing hardness of materials etc. 5374. Mar. 4.

Driver and Sunderland. Apparatus for testing colour fastness in dyed fabrics. 5788. Mar. 8.

Fletcher and Lewis. Device for testing milk. 5404. Mar. 5.

Khan. Pyrometer or high-temperature thermometer. 5133. Mar. 1.

Muddiman. Adjustable means for holding nitrometers etc. having mercury bulbs. 4522. Feb. 24.

Rideal and Tarrant. Detection and estimation of ammonia in gases. 5904. Mar. 10.

COMPLETE SPECIFICATION ACCEPTED.

19,066 (1918). Aktiebolaget Ingeniörsfirma Egnell. Gas-analysing apparatus. (120,921.) Mar. 5.

I.—GENERAL; PLANT; MACHINERY.

Liquids; Washing — with liquids. C. H. Borrmann. Z. angew. Chem., 1919, 32, 46—48.

THE method of extracting one liquid with another by counter-current contact in a column filled with Raschig's rings or other suitable packing material is likely to supersede the older method of shaking or stirring intermittently and separating the two layers of liquid. An apparatus for counter-current contact between two liquids or a liquid and a gas was described by the author for large-scale work (this J., 1915, 1232). The device recommended by Raschig (this J., 1918, 677A) does not meet all requirements, because it takes no account of the alterations in density of the liquids as the result of their mutual action. In washing one liquid with another in this way, the lighter liquid should enter at the bottom of the column and flow slowly out at the top, while the heavier liquid should enter at the top and fall downwards in a finely divided form. If the lighter liquid is the solvent it may become heavier through its enrichment in the extracted substance and the action of the column may be upset through the fresh, lighter portions of the solvent which enter at the bottom rising suddenly to the top, while the enriched portions sink. In the author's design this failure of the counter-current principle is avoided as far as possible and the apparatus has worked satisfactorily for years. If the rising liquid becomes lighter, Raschig's design is correct, but Raschig's rings are not necessarily the best type of packing material. In fact, any unsymmetrical type of packing runs the risk of accumulating more on one side of the column than on the other and diverting the even flow of the falling liquid. For this reason, symmetrical packings are always to be preferred and the author uses plates of spiral wire-work simply packed one over the other. These have a maximum surface per unit weight, are easily cleaned, and only occupy 4% of the sectional area of the column. The design of the packing is, however, a minor point and the chief consideration is the correct adaptation of the working principle of the apparatus to the physical conditions to be dealt with. It is important also to make provision for continuous rectification of the products, since each liquid is to some extent soluble in the other and the solvent has to be recovered not only from the extract but also from the residue. Kubierschky's three-column apparatus (*loc. cit.*) provides for this, and several are working with capacities up to 8000 litres per hour.—J. F. B.

PATENTS.

Furnaces; Regenerative gas-fired —. H. N. Davis and W. R. Twigg, Luton. Eng. Pats. (A) 122,673 and (B) 122,674, 23.12.17. (Appls. 19,189 and 19,190/17.)

(A) THE furnace comprises a heating chamber and a number of chambers which can be employed either as regenerators or preheaters. These regenerators or preheaters are provided in sets of two arranged longitudinally left and right in the furnace structure, and two sets of burners supplied with pressure air are similarly provided in the furnace proper, the pressure air necessary for the combustion of the gas induced being preheated by passage through the appropriate preheater. The products of combustion are discharged through the regenerator chambers. The sets of burners are employed alternately, the sets of chambers meanwhile being employed as preheater and regenerator respectively. The change over from one set of burners to the other is effected by means of a valve so devised that the rôles of the preheater and regenerator are simultaneously interchanged when

the valve is operated. In this manner the second set of burners is supplied with preheated air, and the heat of the products recovered regeneratively.

(B) In a furnace of the type described under (A) the air and gas valves are so mounted and connected that the supplies of air and gas are controlled simultaneously.—J. S. G. T.

Heating furnace with removable hearth. E. C. R. Marks, London. From Soc. Anon. Ital. Gio. Ansaldo & Co., Genoa, Italy. Eng. Pat. 122,928, 16.2.18. (Appl. 2799/18.)

IN a furnace having a removable hearth provided with openings in its upper part through which gases pass to a collecting flue within the hearth, the collecting flue is arranged transversely. Lutes are provided between the sides of the hearth and the furnace walls both above and below the flue.

—C. A. K.

Smoke, furnace gases, exhaust gases and the like; Treating —. J. W. Stansfield, Hartlepool. Eng. Pat. 122,871, 26.1.18. (Appl. 1523/18.)

THE smoke or other gas is sprayed with water in a constricted part of a chamber, the spray being projected in the direction of motion of the gas. The washing water is subsequently treated for the recovery of any valuable products washed out of the smoke etc. The device is claimed to afford increased draught for boiler or other furnaces. (Reference is directed in pursuance of Sect. 7, Subsect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 15,418 of 1900, 18,744 and 27,947 of 1907, and 20,903 of 1908.)—J. S. G. T.

Drying granular materials; Process and apparatus for —. A. Huhn, Minneapolis, Minn., U.S.A. Eng. Pat. 122,910, 7.2.19. (Appl. 2242/18.)

A BATTERY of steam pipes is arranged inside a drum rotating about an axis slightly inclined to the horizontal. The inlet and outlet for the granular material to be dried are sealed by the material itself. The material after entering the drum is lifted by flights, and poured down over the steam pipes. Moisture expelled during the drying is removed through a pipe situated at the upper end of the drum. A partial vacuum is maintained within the drum by means of a positive blower, the degree of evacuation being regulated by the admission of air to the lower part of the drum. Any dust particles are removed from the moist exit gases by means of centrifugal dust collectors before the gases reach the blower.—J. S. G. T.

Dryer [for grain, beets, grass, malt, etc.]. F. Koblank, Brackwede. Ger. Pat. 309,010, 12.12.14. Addition to Ger. Pat. 293,416.

IN a dryer similar to that described in the chief patent (this J., 1916, 1145), the rotation of the ventilator fans attached to the axes of the drums is independent of that of the drums.—L. A. C.

Drum dryer; Steam-heated, rotary —. S. Mertens, Brunswick. Ger. Pat. 309,084, 8.5.17.

IN a rotary drum dryer, having shelves or ledges for lifting the material inside, the shelves are not fixed radially, but are inclined in the direction of rotation of the drum.—L. A. C.

Vacuum dryer. B. Schilde Maschinenfabrik und Apparatebau, G.m.b.H., and A. Boleg, Hersfeld. Ger. Pat. 309,086, 26.4.16.

WITHIN a vessel fitted with a removable air-tight lid, is a group of heating plates, the material to

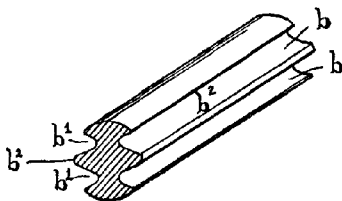
be dried being placed in the spaces between the plates. The group of plates is surrounded on at least four sides by a heat insulator, and the walls of the vessel itself are either uninsulated or provided with a cooling jacket. A tube leads from the bottom of the vessel through a cooler to a receptacle underneath.—L. A. C.

Evaporators. P. Kestner, Paris. Eng. Pat. 122,958, 22.3.18. (Appl. 5107/18.)

THE liquor undergoing concentration and the vapour given off are passed together through a long duct surrounded by a steam jacket. The duct consists of at least three vertical sections, from the upper end of the last of which the liquor and vapour are delivered into a separator. In this way the hot concentrated liquor is obtained at such a level that it can be transferred by gravity to any vessels desired.—W. H. C.

Filter-presses. J. A. Wilson, Manchester. Eng. Pat. 122,979, 22.5.18. (Appl. 8482/18.)

BARs of the form shown in the figure are built up vertically in a frame to form a corrugated filter-plate. The ribs, b^2 , abut on similar ribs of adjacent bars, while the channels, b , b^1 , serve to conduct



the filtrate to a collecting duct in the lower part of the frame. Owing to the form of the surface, the filter cloth cannot sag into the drainage channels and block them.—W. H. C.

Filters. The Pulsometer Engineering Co., Ltd., and J. Björnstad, Reading. Eng. Pat. 123,152, 12.2.18. (Appl. 2524/18.)

THE bottom plate of the filter is provided with a number of recessed pockets the bottoms of which are perforated and provided with water nozzles, whilst the spaces between the pockets are perforated and provided with air nozzles. The water and air required for cleansing the filter medium are supplied separately under pressure. The air being delivered just beneath the plate and above the level of the water nozzles, depresses the level of the water slightly and passes upwards through the air nozzles while the water passes upwards through the water nozzles.—W. H. C.

Filter; Suction. R. Wüster, Dassel. Ger. Pat. 309,015, 17.3.18.

A suction filter consists of two cylinders, one sliding inside the other, with an air-tight ring attached to the lower end of the inner cylinder. By drawing upwards the inner cylinder, the bottom of which forms the filtering surface, a partial vacuum is created in the space between the bottoms of the two cylinders. The liquid to be filtered is led into the inner cylinder.—L. A. C.

Filter; Suction. C. A. Beringer, Charlottenburg. Ger. Pat. 309,016, 10.1.17.

IN a suction filter means are provided whereby, on stopping the introduction of the liquid and continuing the suction, the surface of the filter

cake is covered over, thereby preventing access of air and the formation of cracks in the cake. Liquid for washing the cake may be added through the covering if this is constructed of a permeable material. A suitable appliance consists of a filter cloth loosely attached to a frame suspended in the liquid which is being filtered. The filter may be built up of several units as in a filter-press, each containing the necessary means for covering the cake.—L. A. C.

Separating immiscible liquids; Apparatus for. J. L. Sands, London, and J. Gourlay, Glasgow. Eng. Pat. 123,033, 28.10.18. (Appl. 17,520/18.)

THE closed float of the separating apparatus described in Eng. Pat. 106,165 (this J., 1917, 698) is replaced by an open-topped float of large dimensions into which tubes depend from the separating drum. The float is sustained by a spring the tension of which can be adjusted.—W. H. C.

Mixing granulated or triturated materials; Machines for. L. McG. Fraser, and W. J. Fraser and Co., Ltd., Romford. Eng. Pat. 123,135, 7.2.18. (Appl. 2246/18.)

THE materials to be mixed are fed from a hopper into a pivoted shoot, which passes through the front of the mixing drum and discharges the material near the rear end of the drum. The latter is provided with internal lifting blades, and is rotated on rollers. As the drum rotates, the materials are lifted by the blades and dropped into the shoot, by which they are returned to the rear end of the drum. When the mixing is complete the shoot is tilted and the mixed materials are discharged.—W. H. C.

Samples of liquids; Apparatus for automatically taking. T. Roberts, Bolton. Eng. Pat. 123,173, 18.2.18. (Appl. 2827/18.)

IN apparatus of the type in which the liquid to be sampled is fed into a central vessel which is rotated above a series of stationary receptacles, electrical or other devices are provided by means of which the rotation of the central vessel may be controlled from a distance, for instance from a central office.

Pulverising-mills. H. Walker, London. Eng. Pat. 123,259, 25.6.18. (Appl. 10,474/18.)

IN a ring and roll mill the rolls, which take the form of hoops mounted on discs, are pressed by a spring or other suitable device against the revolving ring. The rolls and ring are larger in diameter at the centre than at the ends.—W. H. C.

Heat changes; Method and apparatus for inducing. R. Vuilleumier, New Rochelle, N.Y. U.S. Pat. 1,275,507, 13.8.18. Appl., 29.1.17.

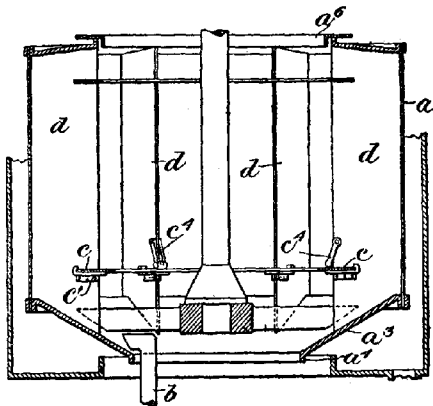
THE invention comprises methods and apparatus whereby the heat expended in doing positive or negative work upon expansion or contraction of a fluid is utilised to secure secondary heating or cooling effects. A cylinder having walls of high conductivity is furnished with two easily movable pistons, each piston being provided with a suitable heat regenerator. One end of the cylinder is surrounded by a heating jacket and the other end by a refrigerating jacket, the central section being surrounded by a cooling jacket. The cylinder is charged with any suitable fluid, e.g. air. A cycle of operations of the pistons is described during which the regenerators produce primary heat changes of equal but opposite values, these inducing

secondary heating and cooling effects. The cycle being repeated, the cumulative effect of such heating and cooling enables any desired degree of heating or refrigeration to be attained.

—J. S. G. T.

Centrifugal-separator. D. B. Weston, Sharon, Mass. U.S. Pat. 1,279,057, 17.9.18. Appl., 15.11.13.

THE material is fed through the pipe, *b*, on to the sloping bottom ring, *a*³, of the rotating basket, *a*, and is thrown against the peripheral wall of the basket by the directing plate, *c*, and the action

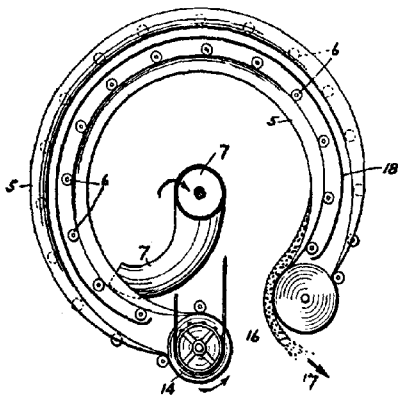


of centrifugal force. The solids collect on the wall between the radial division plates, *d*, and the liquid escapes between the edge of the deflecting ring, *a*⁶, and the upper edge of the basket. The directing plate, *c*, is made in sections, the outer parts resting on the ledges, *c*¹, and being held in position by the catches, *c*², so that when discharging the solids the sections can be lifted inwards and the solids dropped through the opening, *a*⁴.

—W. H. C.

Centrifugal apparatus. J. L. Hiller, Mattapoissett, Mass. U.S. Pat. 1,280,469, 1.10.18. Appl., 19.9.13.

THE material to be separated is fed through the shoot, 7, on to the inner concave face of the endless band of filter-medium, 5, which travels twice



round the periphery of a rotating drum, being actuated by the sprocket wheel, 14, and guided

by the rollers, 6. The centrifugal force causes the liquid to pass through the band and it is then guided by the plate, 18, to the discharge. The solids are carried round by the band and discharged through the gap, 16, as indicated by the arrow, 17, the band itself returning round the outer path to the sprocket wheel, after which it again receives supplies of material from the shoot, 7.—W. H. C.

Vacuum-separator. II. A. Thuneman, St. Louis, Mo. U.S. Pat. 1,281,881, 15.10.18. Appl., 16.3.17.

THE separator comprises an outer vertical cylindrical casing, closed at its upper end, the lower end being connected to an exhaust and thence to a discharge pipe. Pulverised products are carried vertically upwards into the separator by means of a current of air, and impinge against a deflector composed of a pair of conical frusta attached base to base with axes vertical. The heavier particles, owing to decrease of velocity, fall into a hopper leading to a discharge pipe fitted with an air valve. The lighter particles are carried further by the air current into a chamber composed of a number of telescoping sections, the total height of which may be regulated from outside. Here further deposition of heavy particles occurs, these being recovered via the hopper as above. The lighter particles pass over the top of the uppermost telescopic section, down through the outer casing, and through the exhaust into a receptacle.—J. S. G. T.

Sludge; Apparatus for removal of — from liquids.

Brünn-Königsfelder Maschinenfabrik der Maschinen- und Waggonbauwerks-Akt.-Ges. Simmering, vorm. H. D. Schmid, Königsfeld. Ger. Pat. 309,039, 16.4.16. Int. Conv., 6.12.13 and 14.12.15.

THE liquid is sucked through a number of disc-shaped filters arranged around a hollow cylinder and separated into sectors. Within the cylinder is a compressed air tube containing slots equal in number to the filter discs, there being also corresponding slots in the cylinder itself, so that when the slots are opposite one another, the filter sector connected therewith is blown free of the mud layer.

—L. A. C.

Solution of solids; Process for the continuous —, especially for slaking lime with sugar juice or water. H. Eberhardt, Wolfenbüttel. Ger. Pat. 309,332, 4.12.17. Addition to Ger. Pat. 268,442.

IN an apparatus similar to that described in the chief patent (this J., 1914, 127), the sieve and scraper are omitted, the solution cylinder being lengthened to a corresponding extent. To the upper side of the lower end of the tube containing the worm elevator is fixed a wide tube, which serves in place of an opening in the dissolving vessel for the removal of the solution. In passing up this tube, the solution deposits any fine sediment present, which is then removed together with the remainder of the solid matter.—L. A. C.

Absorption towers; Apparatus for adjusting the head of liquid in — arranged in series. R. Schad, Tuttlingen. Ger. Pat. 309,887, 2.5.17.

IN a series of absorption towers through which a current of liquid flows and into which gases are led in at the bottom, the head of liquid in each tower is adjusted by means of intermediate containers having two divisions so arranged that the level of the liquid in the lower division is equal to that of the previous tower, and in the upper division the head of liquid is that desired in the following tower.—L. A. C.

Distilling; Process for boiling and — H. Frischer, Cologne. Ger. Pat. 308,649, 22.9.17.

IN a still provided with two or more outlet pipes for the vapour, or in a series of stills connected to a common delivery pipe, each outlet pipe passes through a separate vessel in which a portion of the vapour is condensed. The uncondensed vapour is led through the condensed liquid, and as the amount of the liquid, and consequently its resistance to the passage of the vapour, varies with the amount of vapour passing through the corresponding tube, the vessels exert an equalising effect upon the delivery from each tube.—L. A. C.

Emulsions; Apparatus for the preparation of — W. G. Schröder, Dinkelsbühl. Ger. Pat. 309,717, 8.5.17.

THE apparatus is similar to that described in U.S. Pat. 1,237,222 (this J., 1917, 1088), but on the outer surface of the cylindrical portion of the inner chamber are channels wider at the top than at the bottom, whereby the liquids are drawn down and forced into the space between the inner and outer cones. The spindle attached to the rotating chamber can be raised and lowered by means of a lever worked by an adjustable screw.—L. A. C.

Carboy hampers or crates. A. W. Cowburn, and W. H. Cowburn and Cowpar, Ltd., Manchester. Eng. Pat. 123,012, 27.8.18. (Appl. 13,890/18.)

Lifting insoluble or semi-solid matter; Apparatus for — C. H. Adams, Fulford, Yorks. Eng. Pat. 123,169, 16.2.18. (Appl. 2765/18.)

Gas stoves for drying etc. Eng. Pat. 122,492. See II_A.

Still or preheaters. Eng. Pat. 123,163. See III.

Tilting furnaces. Eng. Pat. 120,200. See X.

Tipping furnaces. Eng. Pat. 120,559. See X.

Drying chamber. U.S. Pat. 1,282,363. See XIX_A.

II_A.—FUEL; GAS; MINERAL OILS AND WAXES.

Gas retorts; Regenerative fired — O. Pelscher. J. Gasbeleucht., 1919, 62, 17—19.

THE flue gases from recuperative-fired gas retort settings form a considerable source of potential heat although it is not at present commercially feasible to use it. The fuel consumption reckoned on the coal carbonised in such settings is placed at 18% at least, under normal working conditions, although in new plants under test conditions much lower figures may be attained. With a plant devised by the Koppers Co. it is claimed that the fuel consumption can be reduced to 12% of coke containing 15% of ash and moisture. The heat is supplied from outside gas producers with revolving grates consuming low-grade fuel, and the gas produced can be cleaned prior to entering the setting with advantage to the working life of the refractory material used. The gas and air are preheated to 1000° C. by regenerators of which two pairs are built under each bed of retorts. The direction is reversed every half-hour. The increased thermal efficiency is evident from the temperature of the flue gases, which leave the setting at 240° C. as against 500°—600° C. in

the case of the recuperative furnaces. The continuous mechanical clinkering of the producer is an advantage, conducing to greater regularity of temperature in the setting and obviating much arduous, costly, and often inefficient labour spent in clinkering the fires of built-in producers.—H. J. H.

Carbonisation; Low-temperature — in relation to the production of motor spirit, fuel oils, smokeless fuel, and power gas: its aims and objectives. F. D. Marshall. Gas J., 1919, 145, 383—385, 451—454. (See also this J., 1917, 620; 1918, 2 A, 175 A, 212 T.)

THE author considers that the maximum utilisation of the material and energy of raw coal would be achieved by low-temperature carbonisation of the coal with recovery of the liquid products and a portion of the ammonia, gasification of the resulting coke with further recovery of ammonia, and conversion of the producer gas into electrical power. The ash residue could be employed for brick making etc. The high-temperature carbonisation of a ton of coal at 2000°—2200° F. (1090°—1200° C.) yields 12,000—13,000 cub. ft. of gas of calorific value 500 B.Th.U., 66% of coke residue, 9—10 gallons of tar, and 20 to 28 lb. of ammonium sulphate. Low-temperature carbonisation at 900°—1000° F. (480°—540° C.) results in the production, per ton of coal, of 4000—6000 cub. ft. of gas of calorific value 650 B.Th.U., 70—75% of coke residue, 18—22 gallons of tar oils, and 15—22 lb. of ammonium sulphate. Low-temperature coke obtained by carbonisation in Tozer retorts (this J., 1914, 912) is not friable and moreover a high yield of ammonia is obtained by its gasification. The volatile content of the coke varies from 8 to 12%, the calorific value being 13,300 B.Th.U. per lb. By stripping the gas produced by the low-temperature carbonisation, 1½—4 gallons of an oil of the nature of motor spirit (sp. gr. 0.760—0.800) is obtained per ton of coal. The oils possess the properties of paraffins. Results are tabulated of the yields of the various products obtained by the carbonisation at temperatures below 1200° F. (650° C.) of 21 samples of different coals. The various fractions of the tar oils possess properties rendering them useful as motor spirit, fuel oil, and lubricants respectively. Naphthalene and anthracene are absent. The pitch is characterised by its plasticity and low percentage of free carbon. The Tozer low-temperature retort (*loc. cit.*), in which coal is carbonised in a number of concentric annular iron segments enclosing a central gas way, is described.—J. S. G. T.

Gas; Present and future of — Possibilities of carbonisation of all coal at low temperatures. S. W. Parr. Western Soc. of Engineers (U.S.A.). Gas J., 1919, 145, 388—389.

THE prime function of the gas industry is that of a purveyor of fuel. Attention is directed to various products other than gas, resulting from coal carbonisation, and possible lines of progress of the gas industry are briefly adumbrated. Such lines of progress include the low-temperature carbonisation of coal etc., and the possible hydrogenation of the resulting oils. The author suggests the possibility of fractionating coal gas in such manner that the sulphur compounds, which are all evolved below 600° C., are entirely contained in the one fraction, the rest of the gas being sulphur-free; the line of demarcation occurs just after the first cubic foot of gas per pound of coal has been evolved. Very little value is attached to "lean" gas as compared with "rich" gas. Coke is improved by the retention of the hydrogen evolved during the "lean" gas period, which period commences at about 650° C.—750° C.—J. S. G. T.

[Gas] purification; Secondary reactions of oxide of iron —. G. Weyman. Gas J., 1919, 146, 322–323.

A SECONDARY reaction involving the decomposition of steam by sulphur vapour, with evolution of hydrogen sulphide and sulphur dioxide, is cited to account for the large quantities of steam, sulphur dioxide, ammonia, and hydrogen sulphide found in the gas issuing from a box charged with partially spent oxide and into which gas of normal composition was passing. The reaction, which is reversible, operates increasingly in the direction indicated with rise in temperature, and by passing a mixture of sulphur vapour and steam through a tube at 200° C., sulphur dioxide was produced in sufficient quantity to be detected by smell, and hydrogen sulphide, sulphite, and thiosulphate were also present. The sulphur formed by the reverse reaction is insoluble in carbon bisulphide, and probably spent oxide contains such sulphur. That these reactions occur on the large scale is confirmed by the detection of steam and hydrogen sulphide on opening a heap of freshly discharged oxide, and by the fact that the heap which is at first alkaline, gradually becomes acid. The difficulty in removing the last traces of hydrogen sulphide from gas is no doubt due to the above secondary reaction, and may be overcome by working the last box at a lower temperature, without the admission of steam. The wetter an oxide, the greater will be the amount of sulphur lost through this reaction. The usual fouling tests of oxides do not give reliable results, as sufficient hydrogen sulphide may be formed by this secondary reaction to contaminate the gas before the oxide is spent.—S. S. A.

Ammonia and sulphur; Simultaneous recovery of — in the carbonisation of coal. W. Bertelsmann. J. Gasbeleucht., 1919, 62, 3–4, 21–22.

The author reviews the proposals which have been made to reach a solution of the problem mentioned. The processes of one class, including those of Fabry, Bergfeld, and Cobb (see this J., 1910, 1203; 1913, 414, 471), involve the washing of the gas with solutions of sulphates of heavy metals, ammonium sulphate being formed and sulphide being precipitated. Here the sulphur is recovered separately from the ammonia and has to be oxidised to sulphuric acid. Burkholder's process (this J., 1909, 359; 1911, 13, 1303), using iron compounds, appears to have failed, also Fritzsche's process (this J., 1913, 425), in which aluminium sulphate is used. In another group of processes ammonia is fixed as ammonium sulphite which is then oxidised to the sulphate. Atmospheric oxidation processes seem to be limited by the attainment of equilibrium conditions, while oxidation in solution is attended by loss of both ammonia and sulphur dioxide. Owing to the difficulties attending the considerable dissociation tension of sulphites, Feld devised a process based on the oxidation of thionates, in its more recent form without the use of metal salts. In spite of the way in which the process has been scientifically perfected, in practice it has proved too cumbersome. Other processes employing thionates have been proposed, but it is concluded that the method of oxide purification and sulphuric acid manufacture still remains commercially the most satisfactory.—H. J. H.

Hydrogen; Combustion of —. Volcanic explosions. I. Explosive eruptions and their phases. V. Sabatini. Atti R. Accad. Lincei, 1918, 27, ii., 360–364.

It is shown that water vapour alone is capable of explaining the mechanical effects of volcanoes and the projections from the latter. (See J. Chem. Soc., April, 1919.)—T. H. P.

Hydrogen; Calculations on the combustion of —. Comparison with ordinary explosives. II. V. Sabatini. Atti R. Accad. Lincei, 1918, 27, ii., 405–407. (Compare preceding abstract.)

The energy developed in the explosion of hydrogen under volcanic conditions is compared with that of ordinary explosives. (See J. Chem. Soc., April, 1919.)—T. H. P.

Mineral oil emulsions; Destruction and avoidance of —. R. Koetschau. Z. angew. Chem., 1919, 32, 45–46.

IN the treatment of Galician crude oil considerable quantities of a troublesome by-product are formed consisting of emulsions of crude oil and salt water of various degrees of consistence and stability. Similar emulsions are also produced in the refining of Rumanian machine oil distillates. Among the methods available for the breaking down of emulsions are: centrifugal treatment; selective filtration sometimes in combination with electrolysis; the action of chemicals, for instance, acids; high voltage electrical treatment on the principle of the Cottrell process; the application of heat. In the case of these mineral oil emulsions, the application of heat in open vessels is of little use, but heating under pressure at 120°–130° C. affords a very simple and inexpensive means for the rapid and quantitative separation of the oil and water. In the refining of mineral lubricating oil, emulsions are formed during the process of neutralising and washing the oil distillates, owing to the presence of naphthenic soaps. These naphthenic soap emulsions are broken down by heating for 2 hours under 4–5 atmos. pressure in a closed vessel with direct steam. Treatment with alcohol affords an effective means of breaking down the soap emulsions, but it is too costly for ordinary lubricating oils and is only employed for white oils (vaseline oils) which are refined by the oleum process. The sulphonic acids which are produced in the refining of mineral oils with sulphuric acid possess colloidal characters, and acid distillates containing sulphonic acids give emulsions not only with alkaline liquors, as in the case of naphthenic and fatty acids, but also with water alone. It has been the custom to avoid strong agitation in the neutralising and washing of highly viscous distillates, but when using the steam-pressure system, the mixing may be as vigorous as desired since the emulsions are easily broken down. Moreover, in order to avoid the complications due to the hydrolysis of naphthenic soaps it is desirable to carry out the neutralisation with concentrated solutions; this is now possible, since the emulsion difficulty is solved. In fact, by neutralising the acid distillates directly under steam pressure, emulsions may never be formed.

—J. F. B.

Asphaltic substances; Determination of hard — in oils prepared from Boryslaw crude petroleum. S. Prozynski. Petroleum, 1918, 14, 9–10. Chem. Zentr., 1919, 90, II, 73.

HOTDE's method of determining asphalt (this J., 1909, 831) is not trustworthy when the oil contains paraffin wax. In the case of oils, such as those derived from Boryslaw crude petroleum, which contain paraffin wax, it is necessary to separate the latter from the asphalt. Treatment with hot ether is too tedious, and it is better to use petroleum spirit of b.pt. 50°–65° C., which has previously been purified by treatment with fuming sulphuric acid. The paraffin wax thus separated is very hard and of high m.pt.—C. A. M.

Oils; Viscosity of —. E. Oelschläger. Z. Ver. Deutsch. Ing., 1918, 62, 422–427. Chem. Zentr., 1919, 90, II., 73–74.

If the viscosity factor, Z, of different oils is calculated by means of the formula— $Z = 4.072E + 3.518/E$,

where E represents Engler degrees, and the results are plotted in relation to the temperatures in a logarithmically divided co-ordinate system, a series of nearly straight lines is obtained, which cut one another approximately at one point, viz., $Z=1$ and $t=185^{\circ}\text{C}$. This characteristic holds good for most technical oils, and enables a formula to be constructed to express the relationship between the temperature and viscosity factor or the temperature and Engler degrees. The viscosity of mixtures of oils is not proportional to the ratio of the constituents, but may be calculated approximately by means of the empirical formula— $E_{1+2} = (n_1 E_1 + k n_2 E_2) / (n_1 + k n_2)$, where E_1 and E_2 represent the respective viscosities of the oils to be mixed, E_2 being that of the more fluid oil, n_1 and n_2 the respective proportions, and $k = \sqrt{E_1 E_2}$.

—C. A. M.

PATENTS.

Water used for washing coal and the like; Process for removing loam and clay from — by filtration. H. Herzbruch, Datteln. Ger. Pat. 309,407, 1.2.14.

THE separation of loam, clay, etc., by filtration from water used for washing coal and the like is more efficient if the temperature of the water is raised, e.g., by the addition of the hot water obtained on quenching coke or by means of waste steam.—L. A. C.

[Fuel] briquettes; Manufacture of —. P. Lambert, Zelst, Holland. Eng. Pat. 119,443, 4.5.18. (Appl. 7528/18.) Int. Conv., 24.9.17.

WASTE carbonaceous material such as coal dust or powder, coke waste, brown coal dust, soot, or flue-dust is mixed with about 10% of slaked lime and moulded into briquettes at high pressure. The briquettes are hardened by exposure to steam at 8–10 atmospheres pressure for 6–8 hours.

—W. F. F.

Acid coke; Utilisation of —. G. L. Prichard, Port Arthur, Tex., Assignor to Gulf Refining Co., Pittsburgh, Pa. U.S. Pat. 1,290,345, 7.1.19. Appl., 2.5.17.

Acid coke from sludge acid is mixed with heated oil and burnt.—W. F. F.

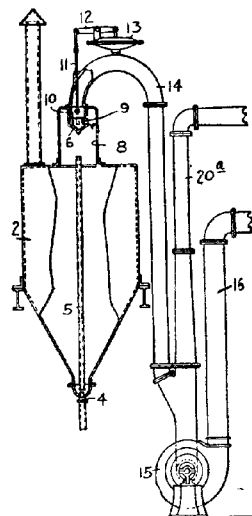
Burning inferior or anthracite fuel in any existing furnace or automatic stoker; Method of and apparatus for —. R. Boizard, Lancey, France. Eng. Pat. 121,449, 20.2.18. (Appl. 3006/18.) Int. Conv., 14.12.17.

FUEL rich in ash or low in volatile constituents is supplied from a hopper on to one end of a travelling furnace grate, where it is retained in a thick bed by a bridge projecting downwards from the furnace roof to within a short distance of the grate. Additional air is supplied to this bed of fuel through openings in the furnace front so as to maintain its incandescence and kindle the fresh fuel supplied. The kindled fuel is carried forward by the travelling grate to the furnace proper. The burnt gases from the thick bed of fuel pass over the bridge and downwards through the furnace roof into the main combustion space. In a modification the openings in the furnace front for supplying additional air to the thick bed of fuel are omitted, the air being supplied only through the grate as part of the main air supply for the furnace.—W. F. F.

Pulverulent fuel; Methods of and apparatus for feeding —. E. C. Covert, Avalon, Pa., U.S.A. Eng. Pat. 123,277, 16.8.18. (Appl. 13,322/18.)

POWDERED coal contained in the hopper, 2, is projected upwards through the pipe, 5, into the cham-

ber, 8, by air injected through the pipe, 4, which has a slightly smaller nozzle. The mixture of coal and air impinges on the conical spreader, 6, and then passes through the openings, 9, into the pipe,



14, and thence to the blower, 15. The mixture is circulated by the blower through the pipe, 16, and back through the pipe, 20a, and the furnaces are supplied by branch pipes from the pipe, 16. The return pipe, 20a, is made of smaller section to maintain the pressure in the pipe, 16. The openings, 9, are automatically regulated by the valve, 10, connected to the rod, 11, lever, 12, and diaphragm, 13. An increase or decrease in the demand by the furnaces causes a corresponding decrease or increase in the pressure in the pipe, 14, and a consequent opening or closing of the openings, 9.—W. F. F.

Water-gas; Process for the simultaneous production of — in the manufacture of lighting gas in continuous vertical retorts. A. Birkholz, Zürich. Ger. Pat. 309,609, 7.3.16.

IN order to accelerate the decomposition of the steam introduced into the retort and to produce gas low in carbon dioxide, the retort receives additional heating, preferably by means of gas withdrawn from the heating-gas producer. Throughout the process the retort is kept at the high temperature required for complete liberation of gas from the contents of the retort, and for the production of water-gas poor in carbon dioxide.—C. A. M.

Gas stoves for cooking, lacquering, drying and other purposes. The Etna Lighting and Heating Co., Ltd., H. R. Prosser, and E. Derry, Birmingham. Eng. Pat. 122,492. (Appls. 1591, 28.1.18, and 12,245, 27.7.18.)

THE oven is constructed of sheet metal and is surrounded on top, bottom, and three sides by an outer casing. A heating burner is arranged below a central opening in the bottom of the casing and is surrounded by a smaller casing having openings in its sides and bottom to admit air. A central horizontal plate in the opening in the bottom of the casing deflects the hot gases upwards round the oven and the colder air at the top of the jacket descends and passes out through the opening in the side of the burner casing. This continues till the jacket is filled with burnt gases at a maximum

temperature and the outflow of these gases then damps down the burner, with a consequent fall in the temperature of the jacket and a following increase in the supply of fresh air to the burner. The outer casing of the oven may be lined internally with asbestos, and with expanded metal which acts as a radiator towards the oven and also deflects the hot gas towards it.—W. F. F.

Petroleum products; Process for transforming heavy — into lighter products. F. B. Deakin, London. From P. Roth and M. E. Venturino, Buenos Aires, Argentine. Eng. Pat. 123,151, 12.2.18. (Appl. 252/18.) Addition to 106,042, 20.8.16.

AN improvement of the process described in the chief patent (see U.S. Pat. 1,208,378 of 1916, this J., 1917, 126). The temperature of the contents of the retort, i.e., crude petroleum from which the lighter constituents have been distilled, residues of petroleum, asphalt or the like, is gradually raised while the material under treatment is sprayed into the retort, e.g., from 300° C., when the spray is first introduced, at the rate of 2° C. per hour to 420° C.

—J. A. C.

Lignite and other combustible materials; Process for simultaneously producing gas from —, and slag capable of being used for agricultural purposes. E. C. R. Marks, London. From Soc. Anon. Ital. Glo. Ansaldo & Co., Genoa, Italy. Eng. Pat. 123,177, 19.2.18. (Appl. 2924/18.)

SEE U.S. Pat. 1,269,795 of 1918; this J., 1918, 539 A.

Gas-fired furnaces. Eng. Pats. 122,673-4. See I.

Refractory material for surface combustion. Eng. Pat. 123,175. See VIII.

Determining methane etc. Ger. Pat. 309,627. See XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Wood; Researches on the lignin of —. I. Destructive distillation of lignin. E. Heuser and C. Skildebrand. Z. angew. Chem., 1919, 32, 41-45.

LIGNIN was prepared from spruce wood sawdust, previously extracted by ether, by hydrolysing the cellulose with 42% hydrochloric acid according to the method of Willstätter and Zechmeister (this J., 1913, 822). Two treatments with the strong hydrochloric acid left the lignin apparently free from cellulose, giving a yield of 33.12% of dry lignin on the dry wood substance. The lignin contained, in the air-dry state, 9.25% of moisture and 0.485% of ash; it yielded no furfural on distillation with hydrochloric acid but showed a copper value by Schwalbe's method of 12.90%. The methyl value according to Ziesel's method was 6.77%. This lignin was subjected to destructive distillation and the results compared in the following table with those obtained from the raw wood and wood cellulose by Klason:

	Spruce wood	Cotton cellulose	Wood cellulose	Lignin	% by weight
Charcoal ..	37.81	38.82	34.86	50.64	on dry
Tar ..	8.03	4.18	6.28	13.00	on dry
Acetone ..	0.20	0.07	0.13	0.19	on dry
Methylalcohol	0.96	—	0.07	0.90	ash-free
Acetic acid ..	3.19	1.39	2.79	1.09	subst.
CO ₂ ..	56.50	57.87	62.90	9.60	% by
C ₂ H ₄ ..	1.72	1.53	1.56	2.00	vol. on
CO ..	32.55	36.37	32.42	50.90	the
CH ₄ ..	9.23	4.23	3.12	37.50	gases

In the distillation of the lignin, charring began at 270° C. and the reaction was most intense at 400°—450° C.; gas was still produced up to 627° C. As in the case of wood and cellulose, the reaction was exothermic. The formation of carbon dioxide per unit of time was largest at the beginning of the gasification and then fell off rapidly. The lignin is distinguished from the other materials by the large production of methane and carbon monoxide and the small production of carbon dioxide; thus the heating value of the gas from lignin is very high. In a similar way the yield of charcoal and tar is very high in the case of the lignin as compared with the other materials. As regards the yield of methyl alcohol the result was disappointing, as it should have been three times as much as that obtained from raw wood; this deficiency is attributed to the breaking up of the methoxyl groups into gases, owing to the higher temperature employed. If the lignin be digested with dilute hydrochloric acid under steam pressure, larger yields of methyl alcohol can be obtained than by destructive distillation. The acetone also is probably derived from the same groups and the relative yield is low for the same reason; the acetone produced by the distillation of wood cellulose may be derived from the methylpentosans. Acetic acid is formed from the lignin but only to the extent of one-third of the amount produced from the raw wood. Acetic acid is derived both from the cellulose and the lignin and in larger quantities from the former than from the latter; the absence of furfural-yielding groups from the lignin precludes the pentosans as the source of the acetic acid.—J. F. B.

Molybdenum filament: Clean-up of nitrogen by a heated —. Chemical reactions at low pressures. I. Langmuir. J. Amer. Chem. Soc., 1919, 41, 167-194.

WHEN molybdenum filaments are heated to 2000°—2400° abs. in nitrogen at pressures of 40 bars (0.03 mm.) or less in absence of moisture, the filaments lose weight at the same rate as if heated in a vacuum. The nitrogen does not attack the filaments but disappears at a rate independent of the pressure if the latter exceeds 1 bar, the amount of the nitrogen thus disappearing being much less than the chemical equivalent of the molybdenum evaporated. The formation of two compounds of molybdenum and nitrogen is indicated; the properties of these and of the deposit formed on the bulb are discussed. (See also J. Chem. Soc., Apr., 1919.)—T. H. P.

PATENTS.

Wood; Process of destructive distillation of —. O. F. Stafford, Eugene, Oreg., U.S.A. Eng. Pat. 119,040, 10.9.18. (Appl. 14,708/18.) Int. Conv., 10.9.17.

FINELY-DIVIDED wood, e.g., sawdust, is dried and supplied to a heat-insulated retort at a temperature of 100°—250° C., the retort being previously heated to about 400° C. The carbonisation process being exothermic, the temperature of the retort remains materially above the lower limit of 280° C., but below a red heat, and fresh dried and heated wood may be continuously added, and distillation continued without further application of heat.

—W. F. F.

Distilling [wood etc.]; Apparatus for —. W. P. Perry, London. Eng. Pat. 122,925, 14.2.18. (Appl. 2662/18.)

CARBONACEOUS material such as wood or peat is supplied by means of a conveyor and valve to the top of a distillation chamber provided with pipes for

withdrawing vapour at various heights, and the charcoal or the like is withdrawn by a conveyor at the bottom. The charcoal is similarly supplied to the top of an adjacent producer chamber to which air and steam are supplied through perforations at the side. The resulting mixture of carbon dioxide and monoxide with ammonia is passed through a connecting passage near the bottom of the two chambers, and in passing upwards through the distillation chamber distills the fresh charge. The mixture of air and steam may alternatively be supplied to the producer through a pipe which passes through the side and is embedded in the charge. In another modification the fresh charge may be supplied to the top of both chambers and in that case the supply of steam to the producer is unnecessary.

—W. F. F.

Wood; Kilns for carbonising and distilling — E. C. R. Marks, London. From E. Ledoux, Paris. Eng. Pat. 123,111, 25.10.17. (Appl. 15,524/17.)

Wood is distilled in retorts consisting of long horizontal tunnels arranged side by side and separated by walls containing vertical heating flues. The flues are heated by the burning gases from a gas producer, which are passed into horizontal flues above the vertical flues and communicating with them by openings which may be regulated by dampers operated from outside. The wood is loaded into trucks and a train of trucks is passed into the retort which is then sealed. The distillation products are passed to a condenser to recover by-products, and the non-condensable gases are passed on to the combustion chamber of the gas producer, or mixed with air and distributed to different points in the horizontal flue to maintain a uniform temperature in the retort. The retort is constructed entirely of brickwork except the doors and the rails for the trucks.—W. F. F.

Electron-emitting cathodes. Eng. Pat. 123,126. See XI.

III.—TAR AND TAR PRODUCTS.

Tars; Dehydration of various — W. A. Twine. Midland Jun. Gas Assoc., Feb. 27, 1919. Gas J., 1919, 145, 462–464.

HORIZONTAL and inclined retort tars are unsuitable for use in the Diesel engine on account of their high content of solid matter. More suitable tars are obtained if speedy separation of tar and liquor occurs in the hydraulic main; no oil should be allowed to mix with the tar, as emulsification may result. Tar containing small quantities of "pitch oils" may contain over 20% of water. The tar contains from 1% to 30% of free carbon, present chiefly as an emulsion. Various methods of dehydration are noted. In these the tar may be sprayed, centrifuged, or atomised, and heated by hot air or steam, under reduced pressures. The distillation of tar containing 7.5% of water is described. A vacuum equal to 25 in. of mercury was maintained in the still, the end point of the distillation being ascertained from the melting point of the pitch. The resulting oil contained 2.7% of water and the pitch 13.7% of free carbon, its melting point being 89° C. The dehydration of 1½ million gallons of water-gas tar emulsion containing 58% of water was carried out in two stills of the Hird, Hammond, and Chambers type (Eng. Pat. 10,385 of 1912; this J., 1913, 744). For successful working, the following points are to be observed: constant water content of the emulsion, regular

rate and constant temperature of feed to still, water content of outflowing tar to be less than 0.5%. The water content of the outflowing tar was determined by pressing a drop of the tar between two thin glass plates and counting the transparent globules thus produced. The stills are cleaned at intervals of a month, 40–45 cwt. of solid matter being removed. Cleaning is facilitated by having the bottom of the still sloping away from the fire. Condensed products from the still are passed through a separator, the water passing thence to a coke-dust filter. In the ensuing discussion, E. W. Smith stated that for successful distillation the tar before entering the still must be nearly at 100° C. and the condenser area must be ample.

—J. S. G. T.

Benzene; Determination of the degree of purity of samples of — W. J. Jones. J. Soc. Dyers and Col., 1919, 35, 45–47.

THE impurities naturally present in commercial benzene comprise chiefly toluene, xylene, paraffin hydrocarbons, and sulphur compounds; much of the commercial benzene now on the market, however, contains only 1–2% of total impurities. The freezing point of pure benzene is 5.48° C. and the cryoscopic constant for dilute solutions of toluene in benzene has been found to be 4.92. For the determination of the percentage of benzene in commercial samples by the cryoscopic method, the error involved by assuming the total impurities to have the same influence on the freezing point as toluene is practically negligible. The percentage by weight of pure benzene, x , in a commercial sample is calculated from the freezing point, t , of the sample by the formula $x = 90.51 + 1.73t$, in the case of dry samples, and $x = 90.68 + 1.73t$, in the case of wet samples. This method is superior to that based on the determination of sp. gr. and distillation range, in that the presence of paraffin hydrocarbons having the same boiling point as benzene is directly indicated by a depression of the freezing point.

—J. F. B.

Benzene; Analysis of the mixtures obtained in the chlorination of — in presence of catalysts. W. J. Jones. J. Soc. Dyers and Col., 1919, 35, 42–43.

THE mixtures obtained in the chlorination of benzene in the presence of finely divided iron as a catalyst may be analysed with satisfactory results by fractional distillation according to the method of Young and Forsey (this J., 1902, 726). The principal constituents are unchanged benzene, monochlorobenzene, and *p*-dichlorobenzene, together with small amounts of *o*-dichlorobenzene and higher chlorinated products. The sample is first thoroughly shaken with water; the oil is separated and dried with sodium sulphate. A weighed quantity of oil is introduced into a tared round-bottomed flask provided with an 8- or 12-pear fractionating column. The liquid is distilled very slowly and the first fraction is cut at 106° C., the mid-point between the boiling points of benzene and monochlorobenzene. The second fraction is cut at 153° C., midway between monochlorobenzene and *p*-dichlorobenzene. The residue is also collected and weighed. The sum of the three weights will be less than the original weight and the deficit is equally apportioned between the benzene, monochlorobenzene, and the higher chlorobenzenes. These last may be further analysed by transferring the residue from the first fractionation to a tared four-bulb fractionating flask. The temperature of distillation rapidly rises to 171° C. and then more slowly. Distillation is stopped at 195° C. and the distillate is weighed as dichlorobenzenes, chiefly the *para*-compound. The residual oil consists of the more highly

chlorinated benzenes and is small in amount. A typical sample of chlorinated benzene showed the following results:—Weight of washed, dry oil, 283 grms. Fractions: benzene, 31 grms.; monochlorobenzene, 209 grms.; dichlorobenzenes, 40 grms.; residue, 3 grms.—J. F. B.

Pyrocresols (dimethylxanthenes), phenylxanthenes, and Xanthene Brown; Relationship of — to coal tar constituents. F. Ruszig. Z. angew. Chem., 1919, 32, 37–40.

THE isomeric compounds $C_{18}H_{16}O$ isolated by Schwarz (Ber., 1882, 15, 2201; this J., 1882, 442) from the final residue of the distillation of crude phenol, and termed pyrocresols, have the same composition and properties as those obtained from the aluminium compounds prepared by Gladstone and Tribe (J. Chem. Soc., 1889, 55, 51) from *o*-, *m*-, and *p*-cresols. These compounds have now been identified as dimethylxanthenes, whilst the compound $C_{18}H_{16}O$ prepared by Gladstone and Tribe from aluminium phenoxide gives the reactions of xanthene. The decomposition of aluminium phenoxide on heating is in accordance with the equation $-2Al(OC_6H_5)_3 = (C_6H_5)_2O + C_{18}H_{16}O + C_6H_5OH + CH_4 + C_4 + Al_2O_3$. Since crude phenol from coal tar contains the three cresols and phenol it may be assumed that crude pyrocresol is a mixture of xanthene with different isomeric dimethylxanthenes. The oily liquid of high b.p. separating at the end of the distillation of aluminium phenoxide has the composition $C_{18}H_{16}O$, and is formed from xanthene by the substitution of the phenyl nucleus for an atom of hydrogen. On dissolving this oil in strong nitric acid and adding water a yellow amorphous compound is precipitated, and this when reduced with zinc and acetic acid and treated with ammonia yields a brown base, which combines with hydrochloric acid to form a soluble salt. This salt gives a dark red solution, which is decolorised by zinc dust. It is precipitated by sodium chloride and by sodium hydroxide, whilst the precipitated base dissolves in strong sulphuric acid giving a yellowish-brown solution, with pronounced green fluorescence. All the reactions correspond with those of triphenylmethane, except that a brown instead of a red fuchsin is obtained. The name Xanthene Brown is suggested for this dyestuff. The other oily product, boiling above $400^\circ C$., formed in the decomposition of aluminium phenoxide, agreed in composition with diphenylxanthene. The corresponding products obtained in the distillation of aluminium cresylates agreed in composition with tolyldimethylxanthenes, and also yielded Xanthene Browns. The so-called green oils or anthracene oils obtained in the distillation of coal tar yielded brown dyestuffs analogous to those obtained by the method described. Their hydrochloric acid salts were soluble in water, and acted as direct dyes for wool and silk. In neutral or weak acetic acid baths they dyed the fabrics shades ranging from greenish-brown (olive) to violet-brown (lilac) or grey. It is probable that a portion of the anthracene oils consists of triphenylmethane derivatives, and in particular of liquid phenyl- and diphenyl-xanthenes. (See also J. Chem. Soc., 1919, i., 168.)—C. A. M.

Dimethylaniline; Determination of the degree of purity of samples of —. W. J. Jones. J. Soc. Dyers and Col., 1919, 35, 43–45.

THE impurities of dimethylaniline usually consist mainly of water, aniline, and monomethylaniline, together with inappreciable quantities of nitrobenzene, the toluidines and their methyl derivatives, and aminothiophens. The most satisfactory method for the rapid valuation of the dimethylaniline is by

the determination of its freezing point and, apart from water, no appreciable error is introduced by assuming the mean molecular weight of all the organic impurities to be equal to that of monomethylaniline. The freezing point of pure dry dimethylaniline is $2.07^\circ C$., and that of the pure substance saturated with water is $1.75^\circ C$. With samples of these cryoscopic determinations have been made for increasing proportions of monomethylaniline added as an impurity. The results are expressed as straight-line graphs represented by the equations $x = 96.1 + 1.87t$ for the dry samples and $x = 96.7 + 1.87t$ for the wet samples, where x is the degree of purity in % of dimethylaniline by weight and t is the freezing point of the sample. The results of the determinations agree well with those obtained by the acetic anhydride method. When the sample has a freezing point below $-2^\circ C$. it is advisable to dilute it with a known proportion of fairly pure dimethylaniline of which the freezing point is known.—J. F. B.

PATENTS.

Stillls or preheaters for dehydration of tar and other chemical purposes. W. Blakeley, Church Fenton, Yorks. Eng. Pat. 123,163, 14.2.18. (Appl. 2646/18.)

WITHIN an outer casing is a series of horizontal hollow trays diminishing in size as they approach the top of the still. The cavity in each tray is connected to that in the tray above and the tray below. Steam or other heating medium, e.g., furnace gas, is led into the cavity of the bottom tray and passes up the series. Tar is passed in at the top of the still on to the uppermost tray and after passing down the series is led off at the bottom. An escape pipe is provided at the top of the still for the escape of vapour, and condensed products can be removed from the interior through a drain at the lower end. The casing may also be heated externally.—L. A. C.

Asphalt composition. Eng. Pat. 122,922. See IX.

IV.—COLOURING MATTERS AND DYES.

Anthocyanins; Colour variation in —. K. and Y. Shibata and I. Kasiwagi. J. Amer. Chem. Soc., 1919, 41, 208–220.

THE authors have studied the reduction of compounds of the flavone and flavonol series by magnesium and an organic (acetic) acid and on the results obtained, together with those of experiments on the pigments of a number of flowers, a theory of the various flower colours is based. The theory is confirmed by the behaviour of the natural anthocyanin solutions towards the salts of alkaline-earth and heavy metals. The "blue" anthocyanins are considered to be complex compounds of reduced flavonol-glucosides, which possess several hydroxyl groups belonging to the flavonol nucleus besides those of sugar molecules, and the metal with which they are coordinated is probably calcium or magnesium. The "violet," "violet-red," or "red" colouring matters are either the analogous metallic complex compounds of flavonol-glucosides, which contain fewer of the auxochrome hydroxyl groups, or are a mixture of the blue colouring matters and their products of decomposition by excess of acids, i.e., the red oxonium salts of Willstätter (this J., 1914, 18). (See also J. Chem. Soc., 1919, i., 166.)—T. H. P.

Xanthene Brown. Ruszig. See III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

"Cell yarns." A. Leinveber. *Kunststoffe*, 1918, 8, 234—235. *Chem. Zentr.*, 1919, 90, II., 24.

"CELL YARN" is prepared from paper pulp which has never gone through the stage of finished paper. Soda wood pulp is broken down in the edge-runners, brushed out in the hollander, diluted with water, and passed over sand-tables and strainers to the stuff-chest. The stuff is run over the paper machine wire on which it is formed directly into ribbons. The actual taking up of the pulp is done either by pressure or suction, as is customary on certain paper machines or ribbon cylinder machines; long wire machines are preferable to the cylinder machines on account of their greater speed of working and efficiency. The stuff delivered on to the wire in the form of ribbons is drained by suction-boxes and passes from the couch-press on to a drying cylinder, which only removes a portion of the water, leaving sufficient in the strips for the subsequent spinning operation without re-damping. The moist strips are wound up in the form of flat rolls or narrow spools and placed in the spinning machines. The fibres in the yarns prepared in this manner are distributed almost entirely in the longitudinal direction of the strip and the fibres at the edges are not wasted, whereas in yarns twisted from strips cut from paper the fibres are distributed more or less in all directions.—J. F. B.

Sulphite-cellulose waste liquors; A new use for — [as fertiliser]. T. Bokorny. *Chem.-Zeit.*, 1919, 43, 64—65.

The spent wash from sulphite spirit distilleries is especially liable to fungus growths, but the addition of 0.5—1.0% of a mineral acid is sufficient to make the liquid stable. The undiluted spent wash is injurious to plant life, but if no acid has been added, a dilution of one to ten makes it harmless. In practical use as a fertiliser the dilution takes place on the land. Spent wash from sulphite spirit distilleries has been used as a fertiliser as a source of carbon nutrition and, with barley, the crop-yield was considerably increased. The transport and application of the sulphite liquor may be greatly facilitated by converting it into a dry powder by the Krause process (see *Fr. Pat.* 460,895 and *U.S. Pats.* 1,213,659 and 1,213,887; this *J.*, 1914, 64; 1917, 329, 377). The use of sulphite liquor as a carbonaceous fertiliser is based in the first place on the favourable conditions it offers for the development of fungi whereby the air of the soil and that near the ground becomes charged with carbon dioxide, and in the second place on the direct nutrition afforded to the growing plant by the sugars, organic acids, etc., contained in the liquor. Nitrogenous nutrition must be supplied from another source, and for this purpose human urine is a valuable adjunct.—J. F. B.

Lignin of wood. Heuser and Skjöldebrand. See IIa.

Viscosity of nitrocellulose solutions. Leysieffer. See XXII.

PATENTS.

Paper pulp; Refining engines for producing —. R. J. Marx, London. *Eng. Pat.* 122,964, 4.4.18. (*Appl.* 5732/18.)

IN a refiner of the Jordan or other conical type the bars of the shell are made up of groups of stone grinding bars arranged circumferentially;

each group is composed of sets of bars arranged longitudinally with their ends abutting, the number of sets in one group being different from those of a succeeding group and the sets in the adjacent groups being out of alignment with each other. Wedge keys are provided between the groups longitudinally and shorter wedges for anchoring each of the bars. The core or plug has a grooved periphery, with the stone grinding bars in the grooves. The bars in the grooves may consist of sets of two bars each, increasing in width from one end of the core to the other, the bars being grooved on the sides and held in position by cement. The bars of the shell and the core may be grooved on the working face with feeding notches extending longitudinally, some of the bars having one notch and others several notches in discontinuous succession.—J. F. B.

Lignin-producing substances; Process for obtaining the so-called — from wood. Akt.-Ges. für Zellstoff- und Papierfabr., Aschaffenburg. *Ger. Pat.* 309,551, 20.6.16.

THE finely divided wood is boiled with formic or acetic acid containing a small quantity of a mineral acid having a powerful hydrolysing action. For example, in presence of 0.5 to 0.7% of sulphuric acid pine wood yields about four times as much extract (40%) as when that acid is absent. The extraction is promoted by boiling under pressure, by preliminary saturation of the wood with the aid of a vacuum, and by mechanical disintegration of the fibres. The separation of the dissolved substances, which are essentially of the nature of phenols of high molecular weight, is effected by concentrating the solution in a partial vacuum, if necessary after the addition of water. The product is a pale gray powder, insoluble in water, partially soluble in alcohol, benzene, and petroleum spirit, and soluble in formic and acetic acids. The carbohydrates simultaneously extracted remain in solution. The phenolic substances may be used as industrial intermediate products or for pharmaceutical purposes.—C. A. M.

Cleansing material. *Eng. Pat.* 120,195. See XII.

Waterproofed materials. *Eng. Pat.* 123,101. See XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching of striped cotton piece goods. A. C. Walsh. *J. Soc. Dyers and Col.*, 1919, 35, 35—39.

Goods with coloured stripes which are bleached in the piece comprise chiefly coloured shirtings and dhooties with coloured borders. In the former class a good white ground is desired and dyes of great fastness to bleaching have to be used; in the latter, destined only for the Eastern market, clearness of the white is not so essential and colours of only fair fastness are employed. A mixture of grades can only be treated according to the power of resistance of its most sensitive component, and it is always desirable to put a range of patterns through the process before treating the actual pieces. There is no standard method of treatment, but in general the purification and bleaching are performed as efficiently as possible with treatments less severe than those employed for white goods. Thus the alkaline scouring baths are free from caustic; low-pressure kiers are employed with sodium carbonate equal to about 1 lb. per cwt. of

cloth, and boiling is restricted in duration to about 4 hours. A very reliable method is to run the pieces at open width through a boiling alkali solution at 2°–3° Tw. (sp. gr. 1.010–1.015), giving five or six dips, with squeezing and washing. The goods are then packed in a kier provided with an external heater and circulating pump, in which they are treated with alkali solution at 70° C. instead of at the boiling temperature. In the scouring process reduction of vat dyestuffs is liable to occur under the influence of the alkaline solution of organic matters, and these reduced dyestuffs then tend to "mark off" on the white ground. The scouring at the lower temperature practically averts this danger. A preliminary treatment with malt-extract is generally advantageous. In the chemicking process the colours are best preserved by avoiding the acidification of the bleach liquors by the carbon dioxide of the air. The bleach liquor should not be circulated but the goods should be steeped in cisterns and well covered by the liquor, which should be pumped on to them as they are entering the vats. A little lime-water may be added as a precaution. The souring process also should be carried out in cisterns; Turkey Red is nearly always present among these pieces, and the prolonged action of the acid is liable to attack the mordants, making the colour "run." Arrangements must be made for very thorough washing between the various processes and especially to avoid carrying forward bleach liquor into the acid. Washing machines with deep boxes and at least six "nips" must be provided. In some cases a second turn may be given with correspondingly weaker treatments. The final wash must be very thorough, as striped goods generally have to be hot-ironed; a wash with soap clears the whites and protects the goods against acid. In no case should any goods be treated until the degree of resistance of the colours to kier boiling and to bleach liquor with exposure to air has been determined under conditions which reproduce as closely as possible those of actual practice.—J. F. B.

PATENT.

Chlorination of water, alkalinizing and other solutions [for bleaching etc.]. N. K. Turnbull and H. N. Morris, Manchester. Eng. Pat. 122,888, 5.2.18. (Appl. 2039/18.)

The water or alkaline or other liquid to be saturated is supplied to the inner chamber of an atomiser arranged near the top of a receiving tank, and the supply of chlorine gas, preferably from a cylinder of liquid chlorine, is connected with the outer chamber of the atomiser. The relative proportions of the liquid and gas are separately controlled by needle valves attached to the inlets of the atomiser, and the main supply of both is governed by interconnected valves, so that one cannot be opened without the other. A perforated globular chamber of earthenware is fitted over the delivery orifice of the atomiser to spread the mixture of liquid and gas. The tank is provided with a siphon discharge pipe and a vent-flue, connected with the upper part of the tank by means of a siphon, to prevent excess pressure.—J. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitric oxide; Cycle of oxidation of — in the presence of water. A. Sanfourche. Comptes rend., 1919, 168, 401–404. (See this J., 1919, 132 A, 172 A.)

In the presence of water nitric oxide is oxidised to nitrogen trioxide and not the peroxide, the trioxide

then being decomposed by the water, with formation of nitric acid and partial regeneration of nitric oxide. In the presence of concentrated nitric acid (sp. gr. 1.5) the nitrogen trioxide is oxidised with the formation of nitrogen peroxide and water: $2\text{HNO}_3 + \text{N}_2\text{O}_3 = 2\text{N}_2\text{O}_4 + \text{H}_2\text{O}$. If dilute nitric acid is used the action is the same as in the presence of water, until the acid reaches a concentration of about 50% (sp. gr. 1.3), whereupon the second action becomes apparent and increases as the concentration of the acid increases.—W. G.

Ammonia; Synthesis of — at high temperatures.

III. E. B. Maxted. Chem. Soc. Trans., 1919, 115, 113–119. (See also this J., 1919, 232 r.)

The equilibrium ammonia concentration in a mixture of 1 vol. of nitrogen and 3 vols. of hydrogen at increasing temperatures passes through a minimum and then rises to as much as 1.7% in a gas which has been passed in contact with a high-tension electric arc (see this J., 1918, 232). These results have been confirmed, using a larger arc formed between two platinum electrodes on either side of a silica tube with a flattened orifice extending centrally into an inverted flask which served as the reaction chamber. The gas was passed into the flask through a side orifice and emerged down the silica tube across the orifice of which the arc was kept steadily burning. The percentage of ammonia in the emerging gases varied according to the rate of flow, in so far as this influenced the temperature to which the moving gas was heated. A rapid flow of gas caused a considerable decrease in the percentage of ammonia formed. The possibility of the formation of ammonia by the reduction of nitric oxide owing to the presence of traces of oxygen in the gases was studied and every precaution taken to eliminate such a possibility by employing gases free from oxygen. Moreover, the direct synthesis of the ammonia was proved in another apparatus by subjecting the same gas mixture several times to a passage through the arc and determining the ammonia each time by the diminution of volume after absorption. This decrease was found to be constant for every successive passage, corresponding to the formation of 1.6–2.0% of ammonia per operation.—J. F. B.

Ammonia; Formation of — by the electric discharge. E. Briner and A. Baerfuss. Helv. Chim. Acta, 1919, 2, 95–100.

The effects produced on the yield of ammonia obtained by circulating a mixture of nitrogen and hydrogen in a tube containing an electric arc by varying the pressure, the composition of the gaseous mixture, the intensity of the electric current, the distance apart and the material of the poles have been examined. Nickel or iron poles are less efficient than platinum. At low pressures (100 mm.) the amount of ammonia produced per ampère-hour is independent of the distance between the poles. The yield is practically the same at all pressures when a mixture of 1 vol. of nitrogen to 3 vol. of hydrogen is used, but with an excess of nitrogen higher yields are obtained at lower pressures; for example the yield is more than doubled if a mixture of 15 vols. of nitrogen to 3 vols. of hydrogen is used at a pressure of 100 mm. Yields of 7.5–10 grms. of ammonia per kilowatt-hour have been obtained, the volume concentration of the ammonia being 0.6–1%. (See also J. Chem. Soc., Apr., 1919.)—C. S.

Nitrogen compounds; War-time production of — in Germany. Bueb. J. Gasbeleucht., 1919, 62, 2–3.

GERMANY'S pre-war production of nitrogen compounds was in excess of requirements, but a great

deficit became apparent soon after the outbreak of war owing to the cessation of the importation of Chili saltpetre. The supply of ammonia from the distillation of coal was limited by the capacity of the carbonisation industries and did not reach one-third of requirements. At first the production of calcium cyanamide was developed by the erection of several new factories which began to be effective in 1915, but owing to the exigencies of war it became necessary to concentrate efforts on the existing plants. The synthesis of ammonia by the Haber process was found to be the most economical in labour and fuel and the process had already been perfected at Ludwigshafen. A second large factory erected on the lignite coalfield of central Germany came into operation early in 1917, and promises to be the principal factor in the supplies of nitrogen compounds. The catalytic oxidation of ammonia to nitric acid was widely practised, sodium nitrate being produced and thence strong nitric acid by the ordinary process. Experience gained shows that it is only a question of time before concentrated nitric acid will be prepared directly without the intervention of sodium nitrate. In spite of all efforts the supply of nitrogenous fertilisers had to be cut down to 50% of normal requirements. With the passage of war-time conditions it is anticipated that synthetic products in combination with potash will suffice to make Germany independent of imported nitrogen compounds.—H. J. H.

Gas evolved when fused sodium hydroxide is dissolved in water; Nature of the —. W. H. Schramm. Chem.-Zeit., 1919, 43, 69—70.

When fused sodium hydroxide is dissolved in water which has been freed previously from dissolved gases, evolution of a small quantity of gas occurs; from 400 grms. of sodium hydroxide the author collected 14.45 c.c. of gas which contained 4.17 c.c. of oxygen. The gas therefore consisted of 13.33 c.c. of air and 1.12 c.c. of oxygen. The oxygen is derived from the decomposition of a highly oxidised iron compound, probably sodium perferite, $\text{Fe}_2\text{O}_3 \cdot \text{Na}_2\text{O}$, contained in small quantity in the sodium hydroxide. (See also J. Chem. Soc., Apr., 1919).—W. P. S.

Sodium sulphates; Normal and acid —. P. Pascal and Ero. Bull. Soc. Chim., 1919, 25, 35—49.

A study of the equilibrium of the ternary system $\text{Na}_2\text{SO}_4 - \text{H}_2\text{SO}_4 - \text{H}_2\text{O}$ over a temperature range from -30° to 120°C . The results confirm the existence of nine anhydrous or hydrated neutral or acid salts (see further J. Chem. Soc., Apr., 1919). In order to obtain sodium bisulphate from its solutions, a considerable quantity of sulphuric acid must be added, an acidity equal to 65% sulphuric acid being necessary to obtain the anhydrous bisulphate, whilst the acid sulphates of the type $\text{NaHSO}_4 \cdot \text{H}_2\text{SO}_4$ are only obtained with an acidity exceeding 80%. To recover the acid from sodium bisulphate two processes may be adopted. (1) At the ordinary temperature a 40–45% solution of the acid sulphate is prepared and then cooled to -20°C ., the liquid being sown with some of the decahydrate $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$. The liquid phase, when separated from the solid phase thus obtained, contains at the most 30% of sulphuric acid with about 10% Na_2SO_4 . (2) A 75% solution of acid sulphate is prepared at 100°C . and cooled to the ordinary temperature. The liquid phase in this case contains 50% of sulphuric acid. Trials on a large scale with one ton of the acid sulphate showed a complete recovery of the acid by method (1) and an 80% recovery by method (2). Using the heat in the bisulphate, at the moment of tap-

ping, for preparing the solution, method (2) is probably the more economical means of recovering the acid. A diagram showing the fusibility of mixtures of normal sodium sulphate and sulphuric acid is given, from which it is shown that industrial bisulphates (nitre-cake) having an acidity inferior to 36% are partially liquid at ordinary tapping temperatures. They contain in suspension some anhydrous normal sulphate which, on cooling, is transformed at 179°C . into the intermediate sulphate $\text{Na}_2\text{SO}_4 \cdot \text{NaHSO}_4$. In utilising the acidity remaining in bisulphates to prepare dilute nitric acid from sodium nitrate in the presence of water, in order to obtain complete utilisation of the nitrate and to have an easy method of working, it is not advisable to try to use more than half the acidity of the bisulphate, leaving as residue the salt $\text{Na}_2\text{SO}_4 \cdot \text{NaHSO}_4$.—W. G.

Perphosphoric acid; Electrochemical preparation of salts of — and of monoperphosphoric acid. F. Fichter and A. Rius. Helv. Chim. Acta, 1919, 2, 3—26.

Most of the work has been already published (Fichter and Müller, this J., 1918, 731 A; Rius, An. Soc. Fis. Quim., 1918, 16, 573). Perphosphate and monoperphosphate are formed in moderate yield even in the absence of fluoride, provided the electrolyte is rich in alkali. Both salts are also obtained by the electrolysis of a mixture of tetrapotassium and dipotassium pyrophosphates. In strongly acid solution perphosphoric acid decomposes spontaneously in about 2 days into monoperphosphoric acid and phosphoric acid. Monoperphosphoric acid also decomposes in acid solution, but much more slowly than monoperphosphate in alkaline solution.—C. S.

Stannous and arsenious chlorides; Interaction of —. R. G. Durrant. Chem. Soc. Trans., 1919, 115, 134—143.

Stannous chloride reduces arsenious chloride in hydrochloric acid solution with the formation of elementary arsenic. The arsenic is probably first formed in the colloidal state before it is precipitated, and in some cases it subsequently appears in the form of a yellow modification. The appearance of solid arsenic is always preceded by a pale buff tint in the colloidal solution and from this a buff-brown precipitate slowly falls. If this deposit of arsenic, after washing, is immediately shaken with carbon bisulphide a large proportion of it is soluble. A greater yield is obtained if carbon bisulphide is shaken violently with the two chloride solutions while they are reacting. The reaction takes place according to the equation $2\text{AsCl}_3 + 3\text{SnCl}_2 = 3\text{SnCl}_4 + 2\text{As}$, and in the presence of hydrochloric acid of sufficient concentration it is complete in a few hours. The anhydrous chlorides do not give the reaction. The velocity of the reaction increases with increase in the concentration of hydrochloric acid, the curve showing a sharp change in direction at a concentration of about 6.5 N-HCl. Below this point, dilution causes an extremely marked retardation and at 2N-HCl no visible precipitation of arsenic occurs even after 29 days. Next to the influence of hydrochloric acid concentration comes that of the concentration of arsenious chloride, whilst the concentration of stannous chloride has the least influence.

—J. F. B.

Lead sub-acetate and sub-sulphate. H. G. Denham. Chem. Soc. Trans., 1919, 115, 109—113. (See also this J., 1917, 336; 1918, 300 A.)

LEAD sub-acetate has been obtained by the action of acetic anhydride on lead sub-oxide at 195°C .

It is bluish-grey in colour and behaves similarly to other sub-salts of lead. Its solubility in alcohol differs slightly from that of lead acetate, but the behaviour of the two acetates on heating in a vacuum supports the view that the sub-acetate is a chemically individual substance and not a mixture of metal and normal acetate. The sub-sulphate was prepared by the action of methyl sulphate vapour on the sub-oxide at 280° C. The substance is dark grey, and conductivity experiments indicated that it decomposes on solution in water; it appears to be more soluble in alcohol than lead sulphate. On heating at 120° C. above the melting point of lead, no change in its appearance could be detected nor any sign of globules of lead.

—J. F. B.

Tartrates; Test for — depending on the formation of the copper-tartrate complex. L. J. Curtman and B. R. Harris. J. Amer. Chem. Soc., 1919, 41, 207.

The statement made by Curtman, Lewis, and Harris (this J., 1918, 56 A) that comparatively small amounts of phosphates or borates, when treated according to Böttger's procedure ("The Principles of Qualitative Analysis," 1900, 159), respond in the same way as tartrates, is now found to be incorrect; neither of these anions, even in amounts as high as 0.5 gm., gives a blue filtrate.

—T. H. P.

Cuprous oxide; Yellow —. L. Moser. Z. anorg. Chem., 1919, 105, 112–120.

The yellow form of cuprous oxide is best prepared by the reduction of a cupric salt by hydroxylamine in alkaline solution. When first formed the product has a light yellow colour and is probably a hydroxide. It quickly changes, however, to an orange or brick-red colour, probably through loss of water. It can then be dried unchanged. The dried product contains 2 to 3% water, held probably by adsorption. The yellow amorphous cuprous oxide is regarded as a primary metastable form. It is stable at ordinary temperatures, but when heated in absence of air it loses water and changes into the ordinary red crystalline modification. (See also J. Chem. Soc., Apr., 1919.)—E. H. R.

Gallium chloride; Purification by sublimation, and analysis of —. T. W. Richards, W. M. Craig, and J. Sameshima. J. Amer. Chem. Soc., 1919, 41, 131–132.

GALLIUM chloride sublimes and distils at a relatively low temperature and may thus be separated from contaminating chlorides, which are much less volatile. Gallium chloride, prepared from gallium and chlorine, and purified by fractional distillation and sublimation first in a stream of chlorine and afterwards in a vacuum (*cf.* Dennis and Bridgman, this J., 1918, 738 A), showed no trace of impurity when examined in the spectrometer. Atomic weight determinations of gallium made with small quantities of the chloride gave the value 70.10. (See J. Chem. Soc., Apr., 1919.)

—T. H. P.

Graphitic carbon and graphitic acid. V. Kohl-schütter and P. Haennl. Z. anorg. Chem., 1919, 105, 121–144.

The oxidation of graphite to graphitic acid has been studied by treating pure electrically prepared graphite with a mixture of potassium chlorate, sulphuric and nitric acids in the cold. Contrary to what is generally supposed, the colour of the graphitic acid does not depend on

the particular sample of graphite used. By repeated treatment of the graphitic acid with the oxidising mixture, the colour of the product changes from green to yellow whilst the carbon content gradually diminishes from 59.0% after the first treatment to 54.4% after the fifth. The graphitic acid, after repeated washing with water, dissolves to form a reversible colloidal solution. The variable colour of the product is attributed to different degrees of dispersity, the lighter coloured graphitic acid having a more highly disperse structure. The graphitic acid is not crystalline, the apparently crystalline particles being pseudomorphs of the original graphite particles. The decomposition of graphitic acid by heat and by reducing agents has been studied, and it is found that the character of the resulting carbon, graphitic or amorphous, depends upon the reaction conditions, confirming the previous conclusion (this J., 1919, 174 A) that there is no essential difference between amorphous and graphitic carbon. (See also J. Chem. Soc., Apr., 1919.)—E. H. R.

Spectrographic study of the ashes of marine plants. E. Cornec. Comptes rend., 1919, 168, 513–514.

A SPECTROGRAPHIC study of the ashes of laminaria reveals the presence of silver, arsenic, cobalt, copper, manganese, nickel, lead, zinc, bismuth, tin, gallium, molybdenum, gold, antimony, germanium, glucinum, titanium, tungsten, and vanadium. Of these the first eight have already been reported as occurring in marine plants, whilst the next five have been found in sea water. The occurrence of the last six has not been previously reported either in marine plants or in sea water. Gold, bismuth, gallium, and germanium were only present in spectrographic traces in the ashes examined.

—W. G.

Oxide of iron purification. Weyman. See IIA.

Ammonia and sulphur recovery. Bertelsmann. See IIA.

Clean-up of nitrogen by a heated molybdenum filament. Langmuir. See IIB.

Lead in zinc oxide. Collins and Clarke. See XX.

PATENTS.

Acetate of lead and other acetates; Manufacture of —. E. F. Morris, Liverpool. Eng. Pat. 122,953, 12.3.18. (Appl. 4291/18.)

SODIUM acetate solution, *e.g.*, the liquor obtained in the manufacture of chrome yellows from lead acetate, is treated with sufficient sulphuric acid to liberate the acetic acid and then extracted with benzol, toluol, or other organic solvent immiscible with water. The solvent containing the acetic acid is then mixed with an excess of an aqueous solution of basic lead acetate or milk of lime, and the solvent separated from the aqueous solution.—L. A. C.

Aluminium chloride and aluminium-sodium chloride; Process for the manufacture of —. E. E. and P. C. Dutt, Jubbulpore, India. Eng. Pat. 123,243, 10.5.18. (Appl. 7841/18.)

A MIXTURE of calcined clay and sodium (or potassium) chloride is heated to bright redness in a stream of arsenious oxide vapour in a rotary furnace, resulting in the formation of sodium (or potassium) aluminate, silica, and arsenic trichloride: $6\text{NaCl} + 3\text{Al}_2\text{Si}_2\text{O}_7 + \text{As}_2\text{O}_3 = 3\text{Na}_2\text{Al}_2\text{O}_4 + 6\text{SiO}_2 + 2\text{AsCl}_3$. The arsenic trichloride vapour is led

into a brickwork chamber heated to at least 450° C., into which steam is also introduced; and the mixture of arsenious oxide and hydrochloric acid produced passes into a long flue provided at intervals with condensing chambers in which the arsenious oxide collects. The hydrochloric acid is converted into chlorine by the Deacon process, and the chlorine is washed, dried, and led into a retort heated to bright redness and containing briquettes prepared by heating a mixture of hydrated alumina (prepared from the sodium aluminate obtained earlier in the process) and coke made into a paste with tar or oil, either with or without the addition of sodium chloride. Aluminium chloride (or aluminium-sodium chloride, if sodium chloride was present in the briquettes) passes out of the retort as vapour, and is condensed.—L. A. C.

Solution of solids. Ger. Pat. 309,332. See I.

Chlorination of water, etc. Eng. Pat. 122,888. See VI.

VIII.—GLASS; CERAMICS.

Silica bricks; Apparatus [and methods] for controlling the manufacture of —. H. Le Chatelier and B. Bogitch, Rev. Mét., 1918, 15, 511–531.

A good silica brick should contain 95–97% of silica; one of best quality should contain 97% of silica and not more than 1% each of lime, alumina, and ferric oxide. The customary method of analysis—fusion with sodium or calcium carbonate—is inapplicable, as the silica results are inaccurate and the lime and alkalis cannot be determined. Decomposition of the material with hydrofluoric and sulphuric acids gives accurate results for the bases. For control purposes it is sufficient to weigh the resulting sulphates, as the relative proportions of the various bases do not differ greatly from day to day. For the best bricks the sulphates should not exceed 10%. 1 gm. of the very finely powdered sample is heated in a platinum crucible with 20 c.c. of hydrofluoric acid for 12 hours, the temperature being kept so low that evaporation of the acid is then only just complete. The residue is heated with 10 c.c. of N/1 sulphuric acid to decompose the fluorides and then to redness to decompose any organic matter present. After cooling, 1 c.c. of N/1 sulphuric acid is added and the crucible heated until the acid fumes just disappear and the sulphates have a lemon-yellow colour (400° C.), but not to a temperature sufficient to decompose the ferric sulphate. The residual sulphates are weighed. To test the absence of undissolved silica, 20 c.c. of water and 1 c.c. of N/1 sulphuric acid are added, the crucible is heated for a quarter of an hour to a temperature just short of boiling, and its contents are then transferred to a glass flask with about 100 c.c. of water and boiled gently for an hour. Any residue is filtered off and its weight deducted from that of the sulphates; it usually consists chiefly of quartz with a little titanite. Well-burned bricks should have sp. gr. 2.30–2.40. The specific gravity is determined by introducing 8 grms. of the finely powdered brick into carbon tetrachloride or benzene contained in a graduated cylinder and measuring the volume of liquid displaced. The crushing strength should be at least 100 kilos. per sq. cm. but 200 kilos. per sq. cm. is desirable and 300 kilos. per sq. cm. is sometimes reached. The determination of the crushing strength of silica bricks gives such uncertain results that it is preferable to use the Brinell ball test described previously (this J., 1918, 373A). The ex-

pansion and the loss of crushing strength on heating to 1600° C. give important indications as to the behaviour of the bricks when in use in steel furnaces. The maximum expansion and loss of strength both occur at 1500°–1600° C.; above the latter temperature they are affected by the partial fusion which occurs. The expansion after heating to 1600° C. is measured on square prisms of 20 mm. side, and with a height of 50–60 mm. These are heated slowly up to 300° C. (the inversion temperatures of cristobalite) and afterwards rapidly to 1600° C., so that the latter temperature is reached in half an hour. After 1 hour's heating at 1600° C. the furnace is allowed to cool for an hour or more, and the samples are withdrawn when their temperature has fallen below 200° C. The crushing strength at 1600° C. is determined on cubes of 1 cm. side cut from the bricks. The sample is placed in the furnace and the pressure applied to it by means of a sensitive system of external weighted levers mounted on ball bearings. The resistance of the sample may be ascertained from the movement of the levers. The sample is supported by a block of carborundum or electrode carbon, 50 mm. in diameter and 100 mm. high. The pressure is transmitted through a cylinder, 20 mm. in diameter and 30 mm. high, with a cavity, 10 mm. in diameter and 20 mm. deep at the top, into which fits a vertical iron rod connected to the system of levers, its lower end projecting only 10 mm. into the furnace. The cylinder is composed of 90 parts of calcined alumina and 5 of kaolin made into a paste, moulded, and burned at 1700° C. Fragments of old cylinders may be mixed with a little of the fresh mixture and used again. The furnace is heated so as to attain a temperature of 1600° C. in half an hour and is maintained at this temperature until the sample fails under the pressure exerted upon it. The furnace is a vertical cylinder heated by high pressure gas and primary air under pressure of 1 atmosphere, the secondary air being heated recuperatively. The grading of the mixture used for making silica bricks may be estimated by determining the percentage of material passing through a 200-mesh sieve; it should not be less than 25%. The variation in the percentage of the silica flour is the commonest cause of variation in the quality of the bricks. The compactness of the bricks should be constant; it may be judged by comparing the weights of the "green" bricks. The moisture in the "green" bricks should be constant and as high as is compatible with easy moulding. It should be determined regularly several times a day, as workmen tend to use too dry a paste which is easier to work, but produces weak and laminated bricks. The temperature and duration of the firing have a dominating influence on the quality of the bricks. In addition to the use of cones it is desirable to measure the expansion of the bricks at various points in the kiln.—A. B. S.

PATENTS.

Glass furnaces. A. F. Peeters, Leerdam, Holland. Eng. Pat. 123,146, 11.2.18. (Appl. 2440/18.)

A glass furnace has two or more working spaces connected with a single melting space, the total vertical cross-sectional area of the working spaces exceeding that of the melting space. The hot gases for melting the batch enter at one end of the melting space, pass through it and then through the two working spaces to chimneys or flues at the opposite end of the furnace.—A. B. S.

Glass-annealing lehrs. J. and G. Keith, London. Eng. Pat. 123,254, 13.6.18. (Appl. 9727/18.)

A GLASS-ANNEALING lehr comprises a tunnel-like passage inclined upwards from the inlet to a level portion or muffle heated by gas, and down-

wards from the muffle towards the exit, which is somewhat higher than the inlet. The downward portion is provided with flues with adjustable outlets.—A. B. S.

Ovens and kilns for use in the manufacture of tiles, pottery and other ware and for other purposes [; *Combustion chamber for —*]. J. H. Marlow, Stoke-on-Trent. Eng. Pat. 122,927, 16.2.18. (Appl. 2773/18.)

A combustion chamber for tunnel kilns is built up of sectional tubular pieces or hollow slabs formed of several tubes side by side and integral with one another. The slabs are curved and interlock with each other, and are connected so that they form a corrugated arched chamber or flue with double walls having a clear passage between the walls.

—A. B. S.

Tunnel kilns, ovens, and the like. H. Francart, London. Eng. Pat. 122,957, 22.3.18. (Appl. 5081/18.)

ONE or more steam boilers are placed above or at the side of the cooling zone of a tunnel kiln, and are heated by hot air and by gases from this zone, the volume of the air or gases thus utilised being controlled by means of valves. The steam produced passes through pipes extending through the kiln to two water-gas generators, arranged vertically on either side of the tunnel. The resulting water-gas is employed as a fuel for heating the kiln. A portion of the burnt gases from the hot zone of the kiln may also be passed into the generators, the carbon dioxide in the gases being thereby reduced to carbon monoxide.—A. B. S.

Refractory goods; Manufacture of —. G. W. Motttram, Hanley. Eng. Pat. 123,116, 7.11.17. (Appl. 16,229/17.)

IN making refractory bricks and other articles, a suitable binder or flux such as lime or other basic oxide, iron oxide, salts, and/or fireclay is mixed with water and 1–4 times its weight of dry-ground base material, which may be either old, used, or discarded refractory material (silica brick etc.) or new material (silica stone etc.). The mixture is ground until it will pass through a sieve of 30–200 meshes per linear inch, according to the character of the goods to be made, then mixed with a suitable proportion of the base material (previously ground to pass through a sieve of 8–40 meshes per linear inch and saturated with water) in a mixer which has no grinding action, and after standing a sufficient time to stiffen, the excess of water, if any, is removed and the material dried and burned. When fireclay is used as a binder, peaty water, the slime from the effluent of sewage works, or refuse liquid from tanneries may be added to increase the plasticity and binding power of the clay.—A. B. S.

Refractory materials used in surface combustion processes. E. C. R. Marks, London. From Soc. Anon. Ital. Gio. Ansaldo & Co., Genoa, Italy. Eng. Pat. 123,175, 18.2.18. (Appl. 2851/18.)

IMPROVED porous bodies for surface combustion are made of graphite which is agglomerated with tar or the like and the mixture calcined so as to remove the volatile constituents and leave a porous structure. When direct contact between the refractory material and the object to be heated is necessary, very small fragments of graphite are used. Graphite thus prepared is preferable to fireclay as a refractory material for surface combustion because it permits the passage of the combustible gaseous mixtures at a lower pressure and does not swell when heated.—A. B. S.

Graphite crucible. E. Kötteritzsch, Neukölln. Ger. Pat. 298,682, 26.11.15.

THE crucible is made from a mixture containing between 5 and 40% of compounds of the rare earths, e.g., zirconium compounds.—L. A. C.

[*Abrasive*] *composition containing alumina and zirconia.* Norton Co., Worcester, Mass., Assignees of L. E. Saunders and R. H. White, Niagara Falls, N.Y., U.S.A. Eng. Pat. 113,958, 7.2.18. (Appl. 2253/18.) Int. Conv., 12.2.17.

SEE U.S. Pat. 1,240,490 of 1917; this J., 1917, 1130.

IX.—BUILDING MATERIALS.

Wood; Bleaching of — by hydrogen peroxide. C. Marggraf, Kunststoffe, 1917, 7, 165. Chem.-Zeit., 1918, 42, Rep., 200.

FRESHLY cut wood, 1–5 mm. thick, is treated for some days with a 3% solution of H_2O_2 , containing 20 grms. of aqueous ammonia in 11 gallons, the bath being kept alkaline. About 1 kilo. of 3% H_2O_2 is used per square metre of wood (2 lb. per sq. yard). The bleaching is accelerated by warming to 34° C. A pure white is obtained, the strength and toughness of the wood are unimpaired, and the graining is accentuated.—S. S. A.

PATENTS.

Wood-substitute. L. P. Evans, Swanwick, and W. Andrews, Pye Bridge, Derby. Eng. Pat. 122,861, 28.1.18. (Appl. 19,658/17.)

A MIXTURE of sawdust or cork dust 50–70 parts, waste from the manufacture of twine, ropes, bags, cocoa matting, animal hair, or other fibrous material 10–15 parts, and small proportions of silica, alumina, ferric oxide, magnesla, and calcium sulphate is made into a plastic mass with water, and the product is pressed in moulds, then exposed to the air for several days, and impregnated with oils, glue, gum, resin, or wax or a combination thereof. The finished articles are fire- and water-proof.—A. B. S.

Asphalt composition for paving and other purposes; Preparation of —. H. H. Jones, Swansea. Eng. Pat. 122,922, 12.2.18. (Appl. 2510/18.)

A COMPOSITION for paving and similar purposes is made by adding three parts by weight of sand (or a mixture of three parts of sand and one part of any of the following: calcined aluminium silicate, felspar, silica, limestone, or calcined crushed granite) heated to 104°–120° C., to 1 part of tar-asphalt prepared by heating coal tar to 180°–270° C. until it has thickened and attained a specific gravity of 1.18 to 1.21. The composition, which sets in about 20 minutes, may be spread on the road as required or may be moulded into blocks.

—A. B. S.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Speiss; Treatment of copper — in the electric furnace. P. Papencordt. Metall u. Erz, 1919, 16, 6–13.

A SPEISS containing Cu 23.5, Pb 16.3, As 12.1, Sb 13.2, Fe 26.2, Ni+Co 2.9, Zn 3.1, S 2.1, and Au+Ag 0.12%, was fused in portions of 1 kilo. with 0.5 to 1.5 kilo. of pyrites between carbon electrodes in a sealed crucible connected with a condensing

chamber. There were obtained: a matte practically free from arsenic and antimony and containing 75–87% of the copper; a secondary antimonial speiss containing As 0.02–0.27, Sb 16.5–18, and Cu 3.66–7.96% (i.e., about 20% of the copper); a slag; and an arsenical sublimate practically free from antimony. The antimonial speiss was worked up by fusion with coal and sodium sulphate, giving a residue suitable for further treatment along with the matte, and a solution of thioantimonite from which the metal was recovered by electrolysis. The sublimate was re-sublimed, yielding pure arsenic disulphide.—W. R. S.

Tin; Investigation by means of X-rays of the crystal structure of white and grey —. II. Structure of white tin. III. Structure of grey tin. A. J. Byl and N. H. Kolkmeier. Proc. K. Akad. Wetensch. Amsterdam, 1919, 21, 494–500, 501–504.

From the photographs of white and grey tin previously obtained (see this J., 1918, 658 A) the crystal structures of the two forms have been deduced.

—T. H. P.

Gallium; Purification of — by electrolysis and the compressibility and density of gallium. T. W. Richards and S. Boyer. J. Amer. Chem. Soc., 1919, 41, 133–134.

The separation of gallium from indium by a method based on the different solubilities of the hydroxides of the two metals in alkali hydroxide solution is incomplete, but electrolysis in slightly acid solution of the gallium thus obtained yields a metal with m.p. 30.8° C., which is the highest yet found. The compressibilities of solid and liquid gallium are 2.09×10^{-6} and 3.97×10^{-6} respectively and the specific gravities 5.885 and 6.081 respectively. (See also J. Chem. Soc., Apr., 1919.)—T. H. P.

Replacing platinum in electrolytic analysis. Nicolardot and Boudet. See XXIII.

PATENTS.

Steel; Manufacture of —. W. L. Turner, Atherstone, Warwick. Eng. Pat. 123,102, 26.3.17. (Appl. 4315/17.)

ALLOY steel is produced by the "alumino-thermic" process from mixtures containing aluminium, magnesium, silicon, or like elements and oxides, sulphides, chlorides, and other salts of chromium, vanadium, tungsten, cobalt, molybdenum, or like metals, in conjunction with iron or steel. Some of the metals may be employed as constituents of alumino-thermic mixtures, and one or more in the form of iron or ferro-alloys containing carbon.

—T. H. B.

Alloys; Manufacture of —. W. L. Turner, Atherstone, Warwick, and H. A. Blackwell, Blackpool. Eng. Pat. 123,103, 29.3.17. (Appl. 4531/17.)

WASTE or scrap aluminium ("swarf") containing zinc, copper, iron, etc., alone, or in conjunction with commercially pure aluminium, magnesium, silicon, or the like, is used in the reduction of ores, sulphides, oxides, chlorides, or other salts, by the "alumino-thermic" process to form alloys or ferro-alloys.—T. H. B.

"Rustless" or "stainless" or like steel; Manufacture of —. W. L. Turner, Atherstone, Warwick. Eng. Pat. 123,104, 19.6.17. (Appl. 5782/17.)

A LOW-CARBON chrome steel is produced by the action of aluminium upon a mixture of iron oxide practi-

cally free from carbon, and chromium oxide. The mixture may consist, for example, of 72 parts by weight of iron oxide, 34.5 parts of chrome ore (50% Cr₂O₃), and 30.25 parts of aluminium. A steel containing 12 to 15% Cr and substantially under 0.1% C is thus produced.—T. H. B.

Ferro-chromium; Manufacture of —. W. L. Turner, Atherstone, Warwick. Eng. Pat. 123,105, 19.6.17. (Appl. 8813/17.)

FERRO-CHROMIUM free from carbon is obtained from an alumino-thermic mixture of chrome iron ore and aluminium (or other equivalent reducing medium) and bichromate or chromate of potassium or sodium.—T. H. B.

Steel or ferro-alloys; Manufacture of —. W. L. Turner, Atherstone, Warwick. Eng. Pat. 123,113, 31.10.17. (Appl. 15,858/17.)

FINELY divided hammer scale from high-speed steel, containing approximately 80% of iron oxide and about 14% of tungsten oxide, with smaller amounts of oxides of chromium, vanadium, molybdenum, cobalt, manganese, and silicon, is used in the "alumino-thermic" process in conjunction with suitable amounts of ferro-chromium, wrought iron, or mild steel, preferably in a fine state of division, and aluminium, for the direct production of alloy steel.—T. H. B.

Furnace; Tilting —. C. M. Stein et Cie., Paris. Eng. Pat. 120,200, 2.9.18. (Appl. 14,248/18.) Int. Conv., 24.10.17.

CREVICES between the moving and stationary parts of tilting furnaces are sealed by a band of flexible, heat-resisting material (asbestos fabric), one end of which is attached to a fixed support, and the other end to a stretching appliance regulated by a movable balance weight.—C. A. K.

Furnaces; Regenerative tipping —. A. M. Aubert, Billancourt, France. Eng. Pat. 120,559, 10.10.18. (Appl. 16,518/18.) Int. Conv., 22.10.17.

IN ORDER to enable suitable openings in a tilting furnace to be used alternately as inlets and outlets when a reversal of the regenerated gaseous current is effected, a framework fitted with two discs provided with apertures (inlet and outlet) is pivoted on each end of the furnace. A corresponding framework is mounted on the regenerator port to provide a connection. Before reversing the direction of the current, the discs are moved so as to connect the inlet or outlet orifice to correspond with the new conditions.—C. A. K.

Crucible furnaces. H. N. Davis and W. R. Twigg, Luton. Eng. Pat. 123,059, 28.2.18. (Appl. 18,621/18.)

A REGENERATIVE system is provided by two superposed annular passages which surround the crucible chamber, and open into it tangentially. Air under pressure is supplied through each passage alternately with products of combustion and means are provided to reverse simultaneously the direction of flow of the air and heating gas to the furnace.

—C. A. K.

Furnace for re-fusing and refining metal [aluminium]. A. C. Glton, London. Eng. Pat. 123,283, 9.9.18. (Appl. 14,621/18.)

A COVERED crucible with a tapping hole and spout at the base is fixed in the upper part of a furnace chamber. Products of combustion pass around the crucible and are withdrawn from the top of the

chamber and passed around a preheating oven before discharge. The crucible cover is provided with an opening for the admission of metal to be melted.—C. A. K.

Roasting-furnace shaft. E. J. Fowler, Redwood City, Cal., Assignor to General Chemical Co., New York. U.S. Pat. 1,278,129, 10.9.18. Appl., 3.7.15.

A COOLED shaft for a multiple-hearth roasting furnace consists of an outer cylindrical shell with inlet and outlet ports for rabble arms, the ports of one set being angularly disposed to those of the next higher or lower set. The shaft is divided longitudinally into two passages of unequal section by a partition of $\sim$ -section, which is of spiral form so as to separate the inlet from the outlet ports. A cooling medium is supplied through the smaller longitudinal section and passes through the rabble arms and thence outwards through the larger section of the shaft.—C. A. K.

Aluminium alloy. F. R. Rand and C. T. J. Vautin, London. Eng. Pat. 122,870, 7.1.18. (Appl. 369/18.)

AN alloy consisting of 85% to 97.5% of aluminium, and the remainder of an alloy of 20% to 25% of nickel and 80% to 75% of copper.—T. H. B.

Furnace with vertical retorts for zinc distillation. H. Siegel, La Malliene, and J. Thede, Engis. Ger. Pat. 309,468, 26.4.17.

THE combustion chamber for the heating gas is placed at the side of the reduction chamber in its lower half. To minimise loss by radiation the combustion chamber should be circular.—L. A. C.

[**Condensers for zinc furnaces;**] **Presses for the manufacture of hollow articles of refractory materials** [e.g., —]. L. Van Gulck, Bristol. Eng. Pat. 123,009, 10.8.18. (Appl. 13,334/18.)

Crucible smelting furnaces; Tilting mechanism for —, particularly applicable to the lip-axis type. J. Tylor and Sons, Ltd., H. T. White, J. Gaunt, and D. Brookfield, London. Eng. Pat. 123,040, 25.11.18. (Appl. 19,382/18.)

Lead bullion; Process of treating —. G. P. Hulst, Hammond, Ind., U.S.A. Eng. Pat. 123,272, 6.8.18. (Appl. 12,781/18.)

SEE U.S. Pat. 1,285,714 of 1918; this J., 1919, 184 A.

Nickel-copper matte; Process of refining —. C. and O. Langer, Clydach, Wales. U.S. Pat. 1,291,030, 14.1.19. Appl., 10.11.17.

SEE Eng. Pat. 109,402 of 1917; this J., 1917, 1135.

Metal scrap; Treatment of —. E. R. Sutcliffe, Leigh. U.S. Pat. 1,291,672, 14.1.19. Appl., 1.3.17.

SEE Eng. Pat. 103,553 of 1916; this J., 1917, 344.

Heating furnace. Eng. Pat. 122,928. See I.

XI.—ELECTRO-CHEMISTRY.

Formation of ammonia. Briner and Baerfuss. See VII.

Electrochemical preparation of salts of perphosphoric and monoperphosphoric acids. Fichter and Riis. See VII.

Replacing platinum in electrolytic analysis. Nicolardot and Boudet. See XXIII.

PATENTS.

Heating by electric induction; Method of and apparatus for —. The Ajax Metal Co., Philadelphia, Pa., Assignees of E. F. Northrup, Princetown, N.J., U.S.A. Eng. Pat. 111,844, 14.11.17. (Appl. 16,738/17.) Int. Conv., 25.11.16.

THE invention relates to methods and apparatus for heating electric furnaces by the inductive effect of currents of very high frequency (e.g., 25,600, 12,400) compared with the frequencies previously used in power circuits, whereby, owing to the very high rate of change of such currents, the electromagnetic energy associated with the inductor coil can be converted into heat at a high efficiency without the necessity for the interlinkage of iron. The high frequency may be obtained by intermittent oscillatory discharge from a condenser or condensers. A multiphase current supply may be used, with such mutually inductive relations between the phases that the supply of current to the furnace from one phase reacts inductively upon another phase to produce a transfer of energy in the said phase, and *vice versa*. The furnace coil used for the heating means is helically wound from flat strip material, with the wider dimension of the strip placed radially with respect to the helix, and arranged in circuit with a condenser and spark gap. Inductive heating by successive resistors may be employed, the frequency of the inducing current being increased until the rate of change of the current secured makes whole or partial interlinkage of a magnetic material with the induced current circuits of the resistors, unnecessary. Initially, there is a marked preponderance of capacity over reactance, and the initial positive reactance in the supply circuit is substantially balanced by means in the work circuit, for the purpose of securing unity power factor in the supply circuit.—B. N.

Electric furnaces; Improving the conductivity at the joints of electrodes for —. C. W. Kayser and D. W. Macdonald, Sheffield. Eng. Pat. 123,017, 4.9.18. (Appl. 14,372/18.)

A METALLIC spring washer is arranged between the meeting faces of the sections of the electrode and surrounding the central screw plug connecting the two parts. Upstanding resilient wings are connected to both sides of the washer, and molasses is used to fill in the interstices when the faces are screwed together.—B. N.

Cathodes; Electron-emitting — for vacuum discharge tubes, and process of making the same. Western Electric Co., Ltd., London. From Western Electric Co., Inc., New York. Eng. Pat. 123,126, 8.1.18. (Appl. 411/18.)

SUBSTANCES, usually deemed "thermionically" active, such as compounds of alkaline-earth metals, e.g., calcium, strontium or barium oxides, are mixed in desired proportions with compounds of the noble metals, such as platinum or gold. The mixture is applied to a platinum or similar filament, which is heated so as to reduce the compound of the noble metal to the metallic state.

—B. N.

Electric heating by high-frequency currents; Method and apparatus for —. Oscillation-current method and apparatus. E. F. Northrup, Princeton, N.J., Assignor to The Ajax Metal Co., Philadelphia, Pa. U.S. Pat. 1,286,394 and 1,286,395, 3.12.18. Appl., 19.9.17 and 25.11.16.

SEE Eng. Pat. 111,844; preceding.

E

XII.—FATS; OILS; WAXES.

Egyptian lettuce oil. E. Griffiths-Jones. Report and Notes, Pub. Health Lab., Cairo. Reprint. 1918. 7 pages.

LETTUCE oil is expressed from the seeds of *Lactuca scariola oleifera*, a variety of the prickly lettuce extensively cultivated in Upper Egypt. The moistened seed, which contains 33 to 37% of oil, is crushed in a large stone mortar, and the pulp is expressed by means of a vertical hand-press. The oil is of a golden colour, and has a characteristic pleasant taste. It yields no deposit even when kept for a long time at 0° C. A sample expressed from hand-picked seed had the following characters:—Sp. gr. at 15.5/15.5° C., 0.9247; ref. index (Abbé) at 40° C., 1.4672; acid value, 1.8; saponif. value, 190.0; Reichert-Meißl value, 0.1; iodine value (Hübl), 127.0; Polenske value, 0.2; and acetyl value, 12.0. Samples of commercial oil and of oil expressed from commercial seeds had: Sp. gr. 0.9252 to 0.9334; and iodine value, 122 to 136.3. The oil contained linolic acid but no linolenic acid. It behaved like a semi-drying oil, yielding a hard and dry film after 5 days' exposure to the air at 28° to 30° C. A sample of the picked seeds had the following composition:—Oil, 36.3; proteins, 22.7; digestible carbohydrates, 16.3; crude fibre, 6.3; and moisture, 14.3%.—C. A. M.

German resins; Suitability of — for the manufacture of soap. F. Goldschmidt and G. Weiss. Z. angew. Chem., 1919, 32, 32–36.

GERMAN resins are dark and often opaque, especially when obtained by an extraction process. They contain a large proportion of oxidised resin acids, the soaps of which, like those of oxidised fatty acids, are fairly soluble in salt solutions. Hence such resins cannot be used in the manufacture of soap without considerable loss. The following analytical method may be used to determine the amount of this loss:—Ten grms. of the resin and 5 grms. of stearine are gradually introduced, with stirring, into a boiling solution of 25 c.c. of 10% sodium hydroxide diluted with 225 c.c. of water, and the mixture boiled and occasionally stirred for 20 mins., the water being renewed from time to time. An additional 5 grms. of stearine is then added, and the boiling continued for 5 mins., after which 25 grms. of salt is added, and the liquid again boiled for 5 mins. If, on cooling, the lower lye is not clear the presence of alkali is indicated, and a further 3 grms. of stearine must be added, and the boiling repeated for 5 mins. After cooling, the lower lye is filtered, and the soap washed with cold 10% sodium chloride solution. The particles of soap on the filter are added to the main cake of soap, the whole is decomposed with dilute hydrochloric acid, and the separated mixture of fatty and resin acids is melted until clear and then cooled. The aqueous acid layer is separated, and the cake of resin and fatty acids is washed with water until free from acid, the washings being added to the aqueous acid layer. The cake is dried with filter paper and then heated over a very low flame until constant in weight. The acid layer is extracted with ether (200 c.c. in all), the extracts combined and evaporated and the residue dried and weighed, and its amount added to that of the cake of resin and fatty acids. The sum less the quantity of added stearine gives the amount of utilisable resin. The degree of solubility of a resin in petroleum spirit does not afford a criterion of its suitability for soap-making. For example, a resin, which by the above stearine method showed 84.0% of available constituents, contained 41.2% soluble in petro-

leum spirit, whilst in the case of another resin the respective quantities were 88.5% and 61.5%. Certain very dark extraction residues yielded a dark sediment when the soap was salted out, amounting in one case to 43% of the total resin. These deposits were found to consist of acid iron salts of highly oxidised resin acids. The resins are extracted in iron vessels by means of trichloroethylene. This solvent attacks and dissolves the iron and also acts as a catalyst in oxidising the resin acids. A sample of light colophony was converted by the simultaneous action of trichloroethylene, iron, and air, into a dark product analogous in composition to the commercial extracted resins.—C. A. M.

Viscosity of oils. Oelschläger. See IIa.

Fatty acids from varnish oils. Pearce. See XIII.

PATENTS.

Oil cakes; Machines for forming —. J. Davidson, Greenville, S.C., U.S.A. Eng. Pat. 122,864, 31.12.17. (Appl. 19,323/17.)

THE patent relates to improvements in machines for forming oil cakes by means of a hydraulic "former" device, whereby the operation of the machine is rendered more automatic and effective and cakes of uniform character may be produced notwithstanding the presence of lumps in the meal.

Cleansing material; Manufacture of a new —. G. A. Paulin, Asnières, France. Eng. Pat. 120,195, 26.6.18. (Appl. 10,537/18.) Int. Conv., 23.10.17.

A PREPARATION particularly suitable for cleaning fabrics of wool, silk, cotton, etc., is made by hydrating casein with water and treating it with a solution of sodium carbonate, but not in such a way as to dissolve it. The resulting product is mixed with rosin which has been saponified with caustic soda lye. The plasticity and fluidity of the finished preparation depend upon the quantity of water used for hydrating the casein.—C. A. M.

Rubber substitute. Eng. Pat. 123,114. See XIV.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Varnish oils and varnishes; Study of the fatty acids obtained from —. W. T. Pearce. J. Ind. Eng. Chem., 1919, 11, 121.

WITH the object of finding methods for determining China wood oil (tung oil) and other oils that are being used in place of linseed oil in varnishes, the author records the refractive indices of the fatty acids obtained from various mixtures of linseed oil and China wood oil, and the results of the "jelly" test of the fatty acids obtained from mixtures of China wood oil and linseed, menhaden, soya bean, and cottonseed oils. The fatty acids had the following refractive indices at 20° C.:—Pure linseed oil, 1.4666; linseed, 95, China wood, 5, 1.4707; linseed, 90, China wood, 10, 1.4775; linseed, 80, China wood, 20, 1.4824; linseed, 50, China wood, 50, 1.4895. In the "jelly" test, the fatty acids from mixtures of soya bean oil or cottonseed oil and China wood oil gave as good results as did mixtures of linseed oil and China wood oil, but mixtures of linseed, soya bean, and cottonseed oils

gave no jelly. Menhaden oil yielded a small brown residue. Mixtures containing from 10 to 20% of China wood oil gave small amounts of jelly. Fatty acids from a varnish containing copal and rosin and an oil mixture consisting of China wood oil, 25, menhaden oil, 25, and linseed oil, 50%, gave a fair amount of jelly.—W. P. S.

Resins; Separation of — by borax solution. II. Wolff. Chem. Umschau, 1916, 1. Chem.-Zeit., 1919, 43, Rep., 10.

A COMPLETE separation of a mixture of resins cannot be obtained by means of solutions of borax, only a concentration of one of the constituents being effected. Colophony alone is not dissolved, but in admixture with shellac it is partially soluble. Copal is partially soluble alone, and its solubility is affected by the addition of shellac. Shellac, by itself, and generally but not invariably in admixture with other resins, is completely dissolved.—S. S. A.

Resins; Constituents of —. IV. β -Dammar-resen. A. Zinke and E. Unterkreuter. Monatsh. Chem., 1918, 39, 865–869.

ANALYSES and determinations of molecular weight show the hydrocarbon portion of β -dammar-resen (compare Dalb. Jahrb. f. prakt. Chem., 1848, 45, 16; Tschirch and Glimmann, J. Chem. Soc., 1896, 1, 164) to have the composition, $C_{30}H_{48}$; it melts indefinitely at 195° C. after softening at 165° C. and possibly represents a mixture of hydrocarbons.—H. W.

Resins for soap making. Goldschmidt and Weiss. See XII.

PATENTS.

Paint for coating the bottoms of vessels. I. Suzukawa, Hiroshima, Japan. Eng. Pat. 113,612, 9.2.18. (Appl. 2377/18.) Int. Conv., 22.2.17.

A BENZOL solution of a compound obtained by slowly heating together phenol and an alkaloid (e.g., quinine or strychnine) is incorporated with a mixture of a soap of a heavy metal and a fine metallic powder obtained by heating together a mixture of a poisonous oxide of a heavy metal (e.g., lead oxide or copper oxide) and a fatty acid. To the resulting mixture is added rosin, a volatile solvent, and a pigment such as iron oxide. The compounds of phenol with quinine, $(C_6H_5OH)_2.C_{20}H_{21}O_2N$, or with strychnine, $C_6H_5OH.C_8H_7O_2N_2$, are insoluble in water. They are slowly decomposed by salt water with the liberation of a poison which destroys molluscs and seaweeds.—C. A. M.

Water paint; Manufacture of —. C. H. Murray, London. Eng. Pat. 122,940, 26.2.18. (Appl. 3394/18.)

A WATER-RESISTING paint or paint medium is obtained by treating a solution of casein or of casein and soap with alum, washing the precipitate and grinding it with water, with or without the addition of a pigment.—C. A. M.

Gas stoves for lacquering etc. Eng. Pat. 122,492. See IIIA.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENT.

Rubber; Composition having the general properties of — and method of making same. M. Gregory, Tacoma, Wash., U.S.A. Eng. Pat. 123,114, 5.11.17. (Appl. 16,093/17.)

FISH oil or fish scrap rich in oil, or raw fish containing about 5% of oil, is mixed with sulphur, in

the proportion of about 25% of the oil present, at about 175° C. in an open vessel, and the temperature gradually raised to about 220° C. The resulting plastic material is heated at about 155° C. under pressure until the reaction is complete. Alternatively, the mixture, after the gradual addition of sulphur and heating to 220° C., may be treated with further quantities of sulphur and lead oxide, and then heated for 30 to 60 mins. in a closed vessel at about 155° C.—C. A. M.

XV.—LEATHER; BONE; HORN; GLUE.

Sulphuric acid; Method of determining free — in leather. C. Immerheiser. Ledertechn. Rundsch., 1918, 10, 81–83, 86–87. Chem. Zentr., 1919, II., 75–76.

THE ordinary method of determining free sulphuric acid in leather is not applicable to leather which has been tanned with materials containing sulphited tannin extracts, sulphite-cellulose extract, etc. In such cases 10 grms. of the leather is extracted three times for 12 hours each time with 200 c.c. of water at the ordinary temperature, and the united extracts are evaporated with 5 grms. of quartz sand on the water-bath. The dry residue is powdered and treated in a stoppered flask for about 2 hours with 100 c.c. of anhydrous ether, the flask being meanwhile occasionally shaken. The ethereal extract is filtered and the leather again twice extracted with 40 c.c. of anhydrous ether. The united extracts are treated with hydrochloric acid and barium chloride, the ether distilled, and the residue evaporated to dryness on the water-bath in order to decompose the ethylsulphuric acid. The dry residue is treated with 50 c.c. of hot water acidified with hydrochloric acid, allowed to settle, the liquid filtered, and the barium sulphate determined in the usual way. The sulphuric acid thus determined is present in the leather in the free state. The combined sulphuric acid present in the form of soluble sulphates may be determined in the residue from the extraction with ether.—C. A. M.

Artificial leather and leather substitutes; Analysis of —. R. Lauffmann. Z. öffentl. Chem., 1918, 24, 212–220, 239–240.

THE base of artificial leather usually consists of animal fibres (hide, muscle, or wool) either raw or tanned, vegetable fibres, and cellulose, formed into sheets by the aid of such binding materials as caoutchouc, guttapercha, glue, casein, dextrin, starch, resins, tar, etc., varnishes, cellulose esters, and viscose. Oils, particularly castor oil, are added to render the material pliable, and the following are used as fillers:—Aluminium compounds, antimony sulphide, lead oxide, ochre, zinc oxide, zinc sulphate, calcium carbonate, calcium chloride, sodium silicate, cement, and various pigments. A microscopical examination of the material before and after treatment with water and solvents will give some indication of the character of the substances present. The procedure given below is suggested for the chemical analysis of the material; in many cases, it is almost impossible to isolate the various constituents, but these may be separated into groups which may be examined by the usual methods to ascertain, as far as possible, the nature of the components. A. The finely-divided material is extracted thoroughly with ether and petroleum spirit; fatty oils, paraffins, rosin oil, resin, waxes, portions of incompletely sulphonated oils, and certain portions of caoutchouc and guttapercha are dissolved. B. The insoluble residue from A is

extracted with cold water and then with hot water; the aqueous extract will contain glue, gelatin, albumin, casein, starch, dextrin, gum, tannin, glycerol, alkali soaps of normal and oxidised fatty acids, resin acids, and soluble mineral substances. C. The insoluble residue from B is warmed with dilute hydrochloric acid and then extracted with ether; the ethereal solution will contain the fatty and resin acids of soaps which were insoluble in water, and the aqueous acid extract the bases of these soaps together with other mineral substances. D. The residue from C is extracted with acetone; nitrocellulose and acetylcellulose pass into solution probably contaminated with soluble portions of caoutchouc etc. E. The residue from D is dried and the nitrogen is determined in a portion of it; if nitrogen is absent, the material does not contain animal fibres or leather. The residue is then boiled with alcoholic potassium hydroxide solution; oxidised fatty acids, resins from varnishes, sulphonated oils, and animal and vegetable substances are dissolved. F. The insoluble residue from E is extracted with pyridine to dissolve tar, pitch, and asphalt; portions of caoutchouc and guttapercha also go into solution. G. The residue from F is extracted with toluene; caoutchouc and guttapercha are dissolved. The final insoluble residue consists of vegetable fibres, cellulose, and mineral substances. The total mineral substances should be determined and identified in the ash of the original material.

—W. P. S.

Gelatin; Mutarotation of — and its significance.
C. R. Smith. J. Amer. Chem. Soc., 1919, 41, 135—150.

Study of the mutarotation of gelatin solutions indicates the existence of two forms of gelatin, the one, termed the sol Form A, stable above 33°—35° C., and the other, called the gel Form B, stable below 15° C.; at intermediate temperatures the two forms co-exist and the mutarotation appears to be due to the transformation of one into the other by a reaction which is reversible with temperature and apparently bimolecular. Increase in levo-rotation, indicating increasing formation of the gel Form B, follows closely increase in viscosity. For the production of a jelly of standard viscosity a definite proportion of Form B is necessary, and this proportion, increased slightly as the concentration increases, produces the standard viscosity in gelatin solutions of much higher concentrations. At temperatures above 35° C. no gelatinisation of gelatin solutions occurs. The behaviour of gelatin solutions towards alcohol confirms the existence of two forms of gelatin. (See also J. Chem. Soc., 1919, 1, 179.)

—T. H. P.

PATENT.

Leather substitutes, waterproofed materials and the like. S. Goldreich, and M. Stern and Co., Ltd., London. Eng. Pat. 123,101, 8.2.17. (Appl. 1975/17.)

A TEXTILE material (such as cotton or flax) or paper or cellulose, is impregnated with a waterproofing preparation consisting of a mixture of gilsonite (900 lb.) with petroleum jelly (210 lb.) and an oxidisable oil, such as boiled linseed oil (210 lb.), with or without the addition of eucalyptus oil (8 oz.) as an antiseptic agent.—C. A. M.

XVI.—SOILS; FERTILISERS.

Nitrogen-fixing and nitrifying organisms; Effect of carbon bisulphide and toluene upon —. P. L. Gainey. J. Agric. Res., 1918, 15, 601—614.

AZOTOBACTER in soils is destroyed and nitrification is checked if sufficient carbon bisulphide or toluene is applied to the soil. The amounts of antiseptics

necessary to produce these effects vary with the conditions, diminishing for example as the moisture content of the soil rises. If the organisms of the azotobacter group are affected at all they are usually completely destroyed by a given amount of antiseptic, but there is a great difference in the quantity necessary to destroy nitrifying organisms and that necessary to check their activity. There is no appreciable accumulation of ammonia in the soil unless nitrification has been checked. There are present in soils nitrogen-fixing organisms other than azotobacter which are not destroyed by the application of 10 c.c. of carbon bisulphide or toluene to 100 grms. of soil, even when the moisture content of the soil is high.—W. G.

Ammonium nitrate; Use of — as a fertiliser.
E. J. Russell. J. Bd. Agric., 1919, 26, 1332—1339.

THE author has examined the effect of ammonium nitrate as a fertiliser for potatoes, mangolds, and wheat, and finds that, using equal weights of nitrogen, it is as valuable as ammonium sulphate or sodium nitrate. The sample used was of 96% purity and contained 33.5% of nitrogen. Its proper use is as a top-dressing and not as a constituent in mixed manures. With potatoes it is rather risky as it induces a large growth of haulm, which may be disadvantageous if there is much blight. It is essential to use the "non-delluquescent" variety, as the other forms absorb moisture rapidly and either form a tough cake, which cannot easily be broken, or become pasty. The material may contain trinitrotoluene as an impurity, but provided the amount of this impurity does not exceed 1%, no harm need be feared.—W. G.

Sulphite-cellulose waste liquor. Bokorny. See V.

Copper in ashes and soils. Maquenne and Demoussy. See XXIII.

PATENTS.

Phosphates; Enriching of —. E. A. Gaillard, Paris. Eng. Pat. 122,897, 6.2.18. (Appl. 2130/18.)

COMMERCIAL calcium phosphate is treated with sulphuric acid so as to produce superphosphate, which is dried, crumbled, and treated by physical means, such as sifting, centrifugal action, etc., to separate the large particles of superphosphate from the small particles of inert substances. By these means an enriched superphosphate is obtained, together with a waste product or a low-grade superphosphate.—J. H. J.

Fertiliser; Chemical product for use as a —.
R. England, London. Eng. Pat. 122,902, 6.2.18. (Appl. 2167/18.)

IN the manufacture of an improved form of ammonium sulphate for use as a fertiliser, about 5% of phosphoric acid is added to the sulphuric acid in the absorption tanks, in order to obtain a product consisting of a compound or mixture of ammonium sulphate and phosphate. To secure a dry and powdery condition of the product, ground bone or precipitated phosphate is added.—J. H. J.

XVII.—SUGARS; STARCHES; GUMS.

Nitration of sucrose. Hoffman and Hawse. See XXII.

PATENTS.

Sugar; Process of extracting —. L. Naudet, Chelles, France. U.S. Pat. 1,281,057, 8.10.18. Appl., 24.5.17.

IN a diffusion battery system, the dense juice from one diffuser is passed through a large external re-

heater and thence into the top of a second diffuser which has been freshly charged with beet and mashing liquor. The highly heated dense juice possesses little or no extracting power because its density is approximately the same as that of the original beet juice, but it parts with its heat to the new charge and raises the temperature of the beet in the second diffuser to that required for proper working. The hot juice becomes cooled and displaces the mashing liquor, passing out of the system into the measuring tank. As the juice from the first diffuser becomes weaker, owing to partial exhaustion of the charge, it is passed directly through a small heater into the top of the new diffuser and comes in contact with the upper, heated portion of the charge from which it extracts sugar with an increase in its density. Dense juice thus continues to flow from the second diffuser, displacing the weak juice which had collected in the external portion of the system and by-passing it out into the measuring tank. When the external system is again filled with dense juice, this latter is passed into the bottom of a third freshly charged diffuser to serve as mashing liquor. Lastly this third diffuser is fed through the re-heater from the top with dense juice and the second diffuser takes the place of the first.—J. F. B.

Solution of solids. Ger. Pat. 309,332. See I.

XVII.—FERMENTATION INDUSTRIES.

Yeast; Valuation of pressed —. A. Janke. Z. landw. Vers.-Wesen Oesterr., 1917, 20, 12—33. Chem. Zentr., 1919, 90, II., 15—16.

In the valuation of pressed yeast by the baking test, it is advisable to take 120 minutes as the maximum permissible time of fermentation and to credit a bonus to those products which have a fermentation time of less than 100 minutes. Most pressed yeasts show a shorter time of fermentation after storage, so that the test should be made not later than 96 hours after they are discharged from the factory. For estimating the physiological condition of the yeast cell or for judging the keeping properties of the pressed yeast, staining with Methylene Blue solution is most suitable.—J. F. B.

Amylases; Influence of hydrogen-ion concentration on the enzymic activities of three typical —. H. C. Sherman, A. W. Thomas, and M. E. Baldwin. J. Amer. Chem. Soc., 1919, 41, 231—235.

The results of Sherman and Thomas (this J., 1915, 371) on the optimum hydrogen-ion concentration for malt amylase are confirmed and the optimum hydrogen-ion concentration for pancreatic amylase has been more sharply defined; the maltase of *Aspergillus oryzae* resembles malt amylase more closely than the pancreatic enzyme in this respect. The lower and upper limiting values and the optimal value of P_H are: pancreatic amylase, 4, 10, 7; malt amylase, 2.5, 9, 4.4—4.5; *Aspergillus oryzae* maltase, 2.6, 8, 4.8. The influence of the concentration of electrolyte, as distinguished from concentration of hydrogen-ion alone, appears to be greatest with pancreatic amylase and least with the *Aspergillus* enzyme. (See also J. Chem. Soc., 1919, I., 181.) —T. H. P.

Diatase; Course of the formation of — by *Aspergillus niger*. F. A. F. C. Went. Proc. K. Akad. Wetensch. Amsterdam, 1919, 21, 479—493.

MEASUREMENTS of the amounts of diatase formed in different times by *Aspergillus niger* in a solution containing dextrose and various salts show that,

during the first days after germination of the spores introduced, a great quantity of the enzyme is formed in the mycelium. Simultaneously there takes place destruction of the diatase, which is at first negligible compared with the formation but soon becomes so marked that the total quantity of enzyme quickly decreases from the maximum reached about five days after germination begins. Never more than a very small fraction of the enzyme passes from the mycelium, possibly in part from dead cells, into the nutrient solution. (See also J. Chem. Soc., 1919, I., 189.)—T. H. P.

Sulphite-cellulose waste liquor. Bokorny. See V.

PATENTS.

Beverage; Non-alcoholic — and process of making same. A. I. Straus, Baltimore, Md., U.S.A. Eng. Pat. 113,611, 8.2.18. (Appl. 2316/18.) Int. Conv., 23.2.17.

SEE U.S. Pat. 1,223,121 of 1917; this J., 1917, 608.

Dryer [for malt etc.]. Ger. Pat. 309,010. See I.

XIXA.—FOODS.

Cow's milk; The so-called reductase of —. O. Allemann. Milchw. Zentr., 1918, 47, 282—285.

THE rate at which milk decolorises methylene blue-formaldehyde solution (Schardinger's reagent) is influenced to a great extent by the acidity of the milk, the temperature, and the aldehyde content of the solution. The time required for the disappearance of the blue coloration increases with the acidity, and decreases as the temperature rises up to 55°C., and then increases (the limiting temperature is 70° to 75° C.); the most favourable aldehyde content of the mixture appears to vary with different milks.—W. P. S.

Cow's milk; Physicochemical state of the proteins in —. L. S. Palmer and R. G. Scott. J. Biol. Chem., 1919, 37, 271—284.

FROM determinations of the total protein and non-protein nitrogen in the filtrates from samples of fresh skim-milk, skim-milk preserved either with 5.0% chloroform or 0.05% formaldehyde, and of the lactic acid whey from fresh skim-milk, when filtered under pressure through Pasteur-Chamberland filters, it was found that the amount of non-casein protein recovered did not in any case exceed 10% of that in the original milk and in most cases was considerably less than this figure. In the experiments with milk preserved with chloroform or formaldehyde there was only a partial recovery of the non-protein nitrogen of the original milk (see Van Slyke and Bosworth, this J., 1915, 297). The experimental data indicate considerable variation in the size of the pores of different Pasteur-Chamberland filters.—W. G.

Cow's milk; State of proteins in —. L. L. Van Slyke and A. W. Bosworth. J. Biol. Chem., 1919, 37, 285—286.

A REPLY to Palmer and Scott (see preceding abstract).—W. G.

Cow and buffalo milk; Differentiation of —. C. Todd. Reports and Notes of Pub. Health Lab., Cairo. Reprint, 1918. 3 pages.

THE Egyptian Dept. of Public Health has adopted the following standards for the two kinds of milk:—Cow's milk: fat 3%, solids-not-fat 8.5%.

Buffalo milk: fat 5%, solids-not-fat 8.5%. By Uhlenhuth's method of "crossed immunisation" (Arbb. Kaiserl. Gesundh., 1908, 23, 499) it was found that on immunising a cow with buffalo milk the serum from the animal formed precipitins with the milk of the buffalo and cow, and to a less extent with that of the goat. By treating the immunised serum with cow's milk the precipitins for cow's and goat's milk were removed, leaving the specific precipitin for buffalo milk. By means of this precipitin 10% of buffalo milk could be detected in cow's milk. Immunisation of the buffalo with cow's milk only produced traces of a precipitin.

—C. A. M.

Wheat; Determination of acidity and titrable nitrogen in — with the hydrogen electrode. C. O. Swanson and E. L. Tague. J. Agric. Res., 1919, 16, 1–15.

WHEN wheat is extracted by shaking with water at 5° C., 20° C., 40° C., or 50° C., over periods varying from 5 mins. to 24 hours, the hydrogen-ion concentration of the extract, as measured by the hydrogen electrode, is practically independent of the temperature or the duration of shaking. On the other hand, the volume of N/20-barium hydroxide required to bring the extract to a definite P_H value increases with the time of shaking and within certain limits is proportional to it. There is, however, a limit to the volume which is required, which is reached sooner as the temperature of extraction rises. The amino-nitrogen as determined by Sørensen's formaldehyde method is all extracted in two hours at 40° C. In an extract prepared with water at 20° C. the amount of phosphorus directly precipitable by magnesia mixture is about one-half the total phosphorus present, whereas in an extract made at 40° C. the two values are equal.

—W. G.

Barley as a foodstuff. M. Rubner. Arch. Anat. Phys., Physiol. Abt., 1916, 339–50. Chem. Zentr., 1919, 90, II., 18.

EXPERIMENTS were made on human subjects to determine the food value of barley bread, which was given together with fat. The losses determined were in calories 8.11% in one case and 10.96 in another; the losses of nitrogen were 26.54 and 36.45% respectively. In the most favourable case the loss of protein was 15.43%. The average utilisation of the total pentosans was 15.73% and of the cell walls, 38.97%; of the constituents of the cell walls, 53.10% of the cellulose, 37.28% of the pentosans, and 29.55% of the residual substance were utilised; of the free pentoses, 8.53%. The matter unassimilated averaged 5.75%. According to these results, cereals of a similar degree of milling show in general only unimportant differences. Rye, however, even when well milled, is inferior to wheat and barley owing to the inferior digestibility of its protein.—J. F. B.

Vegetables [asparagus, rhubarb, and cucumbers]; Composition of —. M. Rubner. Arch. Anat. Phys., Physiol. Abt., 1916, 151–158. Chem. Zentr., 1919, 90, II., 19.

FRESH asparagus showed 7.61% dry substance, the heads 10.82% and the stems 7.05%. One hundred parts of the dry substance of the heads, stems, and entire vegetable respectively contained: ash, 8.08, 4.90, and 5.23; pentoses, 8.65, 8.74, and 8.75; crude protein, 36.53, 21.94, and 23.44; purified protein, 27.66, 9.85, and 11.27; cellulose, 7.52, 10.03, and 9.77; cell wall, 24.21, 21.00, and 21.32, in which were pentoses, 4.34, 2.12, and 2.31; the calorific values were 431.80, 435.10, and 431.50 Cals. The pressed juice was strongly acid. The pressed juice con-

tained 63.0% of the ash and 43.9% of the nitrogen of the asparagus. Rhubarb stems contained 5.33% of dry substance. One hundred parts of dry substance contained:—ash, 8.42; pentoses, 8.56; cellulose, 15.12; cell walls 27.27, in which were 4.48 of pentoses; nitrogen, 1.95; fat, 8.24; calorific value 338.4 Cals. The cell walls contained 46.44% of the pentosans; their composition was: cellulose, 55.44%; pentosans, 14.50%; residual matter, 30.05%. The expressed juice contained 62.30% of the total dry substance, 90.40% of the ash, 69.80% of the organic matter, and 30.40% of the pentoses. Cucumbers showed 3.69% of dry substance. One hundred parts of dry substance contained: ash, 11.93; pentosan, 7.21; cellulose, 12.74; cell walls, 22.79, with 3.89 pentosan; protein, 18.12; fat, 5.80; calorific value, 386.9 Cals. The cell walls contained 55.90% of cellulose, 17.26% of pentosan, and 26.83% of residual substance. The cell walls contained 53.95% of the total pentosans. The expressed juice amounted to 71.8% of the fresh cucumber.—J. F. B.

Alfalfa [lucerne] silage; Bacteriological studies on —. O. W. Hunter. J. Agric. Res., 1918, 15, 571–592.

SILAGE made from lucerne alone is inferior in quality, but if the lucerne is mixed with available carbohydrate, preferably in the form of molasses, silage of good quality is obtained. The difference in quality is apparently not due to any difference in the microbial flora. The chief chemical differences are a lower acidity and a higher protein decomposition when lucerne is used alone than when admixed with carbohydrate before making into silage.—W. G.

Crude fibre; Digestion apparatus for the determination of —. H. D. Spears. J. Ind. Eng. Chem., 1919, 11, 141–142.

To prevent loss of water by evaporation, a round flask is placed over the top of the digestion beaker and a current of cold water is passed through the flask.—W. P. S.

Pepsin. I. Chemical changes in the purification of pepsin. L. Davis and H. M. Merker. J. Amer. Chem. Soc., 1919, 41, 221–228.

THE purification of commercial pepsin by fractional precipitation, salting-out, filtration, and dialysis is accompanied by gradual elimination of secondary protein derivatives, including α-amino-acids, the purified enzyme tending more and more to approach the proteins (possibly a glycoprotein) in character as the proteolytic activity increases. At the same time, the chlorides are entirely expelled and the phosphorus content undergoes marked diminution, but the sulphur and calcium appear to be unaffected and the proportion of total nitrogen shows very little change. The diminution in the content of α-amino-acid is almost proportional to the increase in proteolytic activity and the small amount left in the most active sample of the enzyme is apparently lysine. The optical activity of the enzyme does not vary with the proteolytic activity. The rennetic activities of the different samples of pepsin obtained correspond closely with the proteolytic activities. (See also J. Chem. Soc., 1919, I., 180.)—T. H. P.

Pressed yeast. Janke. See XVIII.

PATENTS.

Cocoa butter; Preparation of — for cooking and like purposes. G. Martin, and the Co-operative Wholesale Soc., Ltd., Manchester. Eng. Pat. 123,231, 22.4.18. (Appl. 6760/18.)

CACAO butter is melted and mixed while at or above its m.p. with 10 to 20% of starchy material, such

as rice flour, potato starch, farina, etc., and the mixture is cooled and reduced to a powder by disintegrating machinery.—C. A. M.

Drying chamber [for alimentary pastes]. P. Barducci, Naples, Italy. U.S. Pat. 1,282,363, 22.10.18. Appl., 24.2.16.

A CHAMBER for drying alimentary pastes is provided with a fan rotating on a vertical axis which travels along the length of the chamber, and with inlet and outlet air ports in the walls at different levels, so that the air current passes over the material to be dried. The inlet port is arranged so that the air stream is initially parallel to the plane of the fan, and each outlet port is furnished with an exhauster.—J. S. G. T.

Foodstuffs, vegetables and the like; Process for preserving moist —. Ges. für Volksnahrungsmittel, Berlin. Ger. Pat. 305,840, 16.6.16.

THE foodstuffs are dried at as low a temperature as possible until they contain such a small proportion of moisture (about 20–25%) that they are capable of being preserved by no more than the correct quantity of sugar or salt which is necessary for their preparation as food, for instance, 15% of salt or 3–9% of sugar, calculated on the original weight.—J. F. B.

Phosphorus compound contained in vegetable foodstuffs; Process for the manufacture of the assimilable organic —. M. Girard, Assignor to Soc. of Chem. Ind. in Basle, Switzerland. U.S. Pat. 1,290,973, 14.1.19. Appl., 7.7.17.

See Eng. Pat. 109,519 of 1916; this J., 1917, 1191.

Dryer [for grain etc.]. Ger. Pat. 309,010. See I.

XIXb.—WATER PURIFICATION; SANITATION.

Formaldehyde; Fumigation with —. A substitute for the permanganate-formalin method. D. W. Horn. J. Ind. Eng. Chem., 1919, 11, 126–129.

COMPARISON of the bleaching powder-formalin, permanganate-formalin, and bichromate-formalin methods of fumigation showed that by using 620 grms. of bleaching powder and 800 c.c. of formalin for each 1000 cub. ft. to be fumigated, as much formaldehyde gas was evolved as by the use of 250 grms. of permanganate and 500 c.c. of formalin, and at only one-sixth of the cost. Further, the bleaching powder-formalin method was found to be only one-third as costly as the bichromate-formalin method.—W. P. S.

Carbon bisulphide-air mixtures; Course of reaction in explosions of —. G. R. Stewart and J. S. Burd. J. Ind. Eng. Chem., 1919, 11, 130–133.

COMBUSTION of dilute mixtures of carbon bisulphide (25 to 4%) and air always results in the formation of carbon dioxide, carbon monoxide, sulphur dioxide, and some residual carbon bisulphide; sulphur trioxide is not formed. Variations in the reaction appear to take place, however, even under laboratory conditions; greater variations would occur in the field, when fumigation with carbon bisulphide is used for the destruction of small animal pests. On an average, from 25 to 35% of the initial carbon bisulphide is converted into carbon monoxide and sulphur dioxide: $2CS_2 + 5O_2 = 2CO + 4SO_2$; from 40 to 60% is converted into

carbon dioxide and sulphur dioxide: $CS_2 + 3O_2 = CO_2 + 2SO_2$; the balance of 15 to 30% remains unchanged. With 25% of carbon bisulphide the oxygen content of the air is reduced from about 20 to 15%, the carbon dioxide content increases to about 1%, carbon monoxide and carbon bisulphide seldom exceed 1%, whilst the sulphur dioxide content is about 4%. The residual carbon bisulphide and the sulphur dioxide appear to be the important factors in the toxicity of the explosion gases.—W. P. S.

PATENTS.

Water; Apparatus for purifying and softening —. F. J. Talbot, Sheffield. Eng. Pat. 123,198, 9.3.18. (Appl. 4197/18.)

THE water to be softened is treated in the heated condition and after the addition of the necessary reagents is delivered to a mixing chamber inside a large tank. This chamber is not rigidly connected to the side of the tank, but is free to expand under the influence of the hot water. An upwardly inclined pipe leads from the mixing chamber to the top of a completely immersed sedimentation chamber, the top of which is connected to the top of a second similar chamber. These chambers are closed above by sloping roofs with air pipes reaching above the water level in the main tank, and are open below; they are supported or suspended in the tank so as to be movable. The water as it cools passes out from the lower portion of these chambers into the main tank, and then through a wood filter and a sand filter in the tank in the usual manner.—J. H. J.

Water purification; Permeable material for use in plants for —. M. Klinkenberg, Aix-la-Chapelle. Ger. Pat. 309,063, 12.5.17.

A PERMEABLE material for use instead of a layer of ashes in water purification is composed of small dust-free lumps of clinker or ash bound together by means of cement.—J. A. C.

Chlorination of water etc. Eng. Pat. 122,888. See VI.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Holarrhena congolensis, Stapf; Alkaloids of —. F. L. Pyman. Chem. Soc. Trans., 1919, 115, 163–166.

By extracting the bark of the trunk of *Holarrhena congolensis*, Stapf with very dilute hydrochloric acid, making alkaline with ammonia, and extracting with chloroform, the author obtained a dark viscous residue from which were isolated a new alkaloid, holarrhene, $C_{24}H_{38}ON_2$, and conessine, $C_{24}H_{40}N_2$, which had previously been obtained from other species of the same genus. These alkaloids possess a local anæsthetic action but are of no practical value, since they produce local necrosis when injected. The alkaloids are separated by extracting the crude extract, first with light petroleum and then with ether, and purifying the products; the petroleum extract yields most of the conessine, amounting to 0.25% of the bark, and the ether extract the holarrhene in small quantity. The conessine is characterised by its acid oxalate, m.pt. 280° C. (corr.), and the holarrhene by its hydrobromide, m.pt. 265°–268° C. (corr.) after drying. Conessine melts at

125° C. (corr.) and has $[\alpha]_D = -1.90^\circ$ in chloroform solution. Holarrhenine melts at 197°–198° (corr.) and has $[\alpha]_D = -7.1^\circ$. The latter contains a hydroxyl group, and both alkaloids contain three N-alkyl groups, probably methyl.—J. F. B.

Nicotinic acid derivatives. II. Guvacine and isoguvacine. E. Winterstein and A. Weinhausen. *Z. physiol. Chem.*, 1919, **104**, 48–53.

IN view of recent publications on the same subject (Hess and Liebrandt, this J., 1918, 559 A; Hess, *ibid.*, 560 A, Freudenberg, *ibid.*, 560 A) the authors submit a short account of their experiments, fuller details being promised in a subsequent paper. They consider that guvacine is in all probability Δ^3 -tetrahydronicotinic acid, since it yields hexahydronicotinic acid when reduced by hydrogen in the presence of platinum and, when methylated, yields a product which is identical with Willstätter's arecaldine methyl betaine (*J. Chem. Soc.*, 1897, i., 385). Isoguvacine appears to be a simple derivative of pyrrole. (See also *J. Chem. Soc.*, 1919, i., 171.)—H. W.

Adsorbents; Use of — and the estimation of their adsorptive value. I. M. Kolthoff. *Pharm. Weekblad*, 1919, **56**, 207–225, 237–258.

A DISCUSSION of the adsorptive capacity of various substances with reference to their medicinal value. The adsorbents investigated are charcoals, silica, kieselguhr, clays, talc, aluminium hydroxide; the adsorbed substances being Methylene Blue, Congo Red, Alkali Blue, iodine, alkaloids (quinine hydrochloride, strychnine nitrate), mercuric chloride, mercuric cyanide, arsenious oxide, hydrocyanic acid, hydrogen sulphide, and bacteria (*Staphylococcus pyogenus aureus* and *Bacterium coli communis*). The adsorptive activity of blood charcoal (Merck) is extraordinarily marked in comparison with all other adsorbents used.—W. S. M.

Nucleic acids; Pyrrole reaction of true —. R. Feulgen. *Z. physiol. Chem.*, 1919, **104**, 1.

A PINE shaving moistened with concentrated hydrochloric acid is coloured carmine-red by the vapours obtained by heating a dry mixture of sodium nucleate and ammonium chloride; the reaction is not shown by sodium nucleate alone. Since furane derivatives are readily converted into derivatives of pyrrole by dry distillation with ammonium salts, the author regards the reaction as a confirmation of his theory (*Z. physiol. Chem.*, **100**, 241) that the carbohydrate group of the true nucleic acids belongs to the furane type.—H. W.

Geraniol content of citronella oil; Estimation of the —. A. W. K. De Jong. *Proc. K. Akad. Wetensch. Amsterdam*, 1919, **21**, 576–581.

THE method for the estimation of geraniol in citronella oil proposed by Schimmel und Co. (this J., 1899, 1160) is based on quantitative esterification of the geraniol by phthalic anhydride and this the author finds to be impossible of attainment, although with mixtures of geraniol and citronellal the method gives results approximating to the true values. (See *J. Chem. Soc.*, Apr., 1919.)—T. H. P.

Geraniol, linalool, and nerol; Constitution of —. Verley. *Bull. Soc. Chim.*, 1919, **25**, 68–80.

THE author assigns to geraniol the constitution, $\text{CH}_2 : \text{C}(\text{CH}_3)(\text{CH}_2) : \text{C}(\text{CH}_3) : \text{CH} : \text{CH}_2\text{OH}$, to linalool, $\text{CH}_2 : \text{C}(\text{CH}_3)(\text{CH}_2) : \text{C}(\text{CH}_3)(\text{OH}) : \text{CH} : \text{CH}_2$, and to nerol, $\text{C}(\text{CH}_3) : \text{CH} : (\text{CH}_2)_3 : \text{C}(\text{CH}_3) : \text{CH} : \text{CH}_2\text{OH}$, the new formula for geraniol offering

a ready explanation of its close relationship to dipentene. (See further *J. Chem. Soc.*, 1919, i., 146.)—W. G.

Grignard reagent; Action of halogens on the — and replacement of halogen atoms by one another. R. L. Datta and H. K. Mitter. *J. Amer. Chem. Soc.*, 1919, **41**, 287–292.

IN general, one halogen is able to displace other halogens from the Grignard reagent with production of the corresponding haloalkyl derivatives, the yield of the latter being greatly influenced by the nature of the halogen introduced and by the experimental conditions employed. The reaction is sometimes accompanied by secondary reactions due to the union of the Grignard residues. (For experimental results, see *J. Chem. Soc.*, 1919, i., 183.)

—T. H. P.

Organic chemical reagents. III. β -Phenylhydroxylamine and "cupferron" (ammonium salt of nitrosophenylhydroxylamine). C. S. Marvel and O. Kamm. *J. Amer. Chem. Soc.*, 1919, **41**, 276–282.

β -PHENYLHYDROXYLAMINE is conveniently prepared as follows: 8 litres of water, 500 grms. of nitrobenzene, and 250 grms. of ammonium chloride are vigorously stirred in a 4-gallon earthenware jar by means of a mechanical stirrer, 670 grms. of zinc dust (75–80%) being sifted into the mixture during the course of 15–20 minutes; the temperature rises gradually to 50° or 60° C. as the reduction proceeds. In order to obtain a light-coloured product, the temperature should be kept below 60° C., best by addition of small portions of cracked ice; usually less than 1 kilo. of ice is sufficient. The stirring is continued for 15–20 minutes after all the zinc dust has been added, the end of the reaction being indicated by no further rise of the temperature. After being stirred for an additional 5 minutes, the phenylhydroxylamine solution is filtered by suction from the zinc oxide and the residue washed with about a litre of warm water. The filtrate, which should measure not more than 10 litres, is saturated in an enamelled pan with common salt and cooled to 0° C., the phenylhydroxylamine beginning to crystallise out even at 30° C. The average yield of dry product is 290 grms., which is 64% of the theoretical quantity; the loss owing to absorption by the zinc oxide may be partially obviated by the use of pressure filtration. For preparing "cupferron," the moist crude β -phenylhydroxylamine from 725 grms. of nitrobenzene is weighed and dissolved in 3 litres of ordinary ether; the material (sodium chloride) left undissolved by the ether is also weighed, the difference between the two weighings representing fairly accurately the amount of β -phenylhydroxylamine in solution. The ethereal solution is filtered through a dry filter-paper into a 5-litre round-bottomed flask fitted with an efficient mechanical stirrer and immersed in an ice-salt bath. When the temperature of the solution has fallen to 0° C., a rapid stream of dry ammonia from a cylinder of the compressed gas is passed into the liquid and after about 5 minutes the theoretical quantity of freshly distilled amyl nitrite (107 grms. per 100 grms. of β -phenylhydroxylamine) is added slowly from a dropping funnel. The temperature of the mixture should be kept below 10° C.; the addition of the amyl nitrite usually requires about half an hour, during which time the stream of ammonia is continued in order that ammonia may always be in excess; otherwise a coloured product will result.

The mass is stirred for about 10 minutes after complete addition of the amyl nitrite, the "cupferron" being then filtered off and washed several times with small portions of fresh ether. The product is spread on paper until all traces of ether have disappeared and is then stored in bottles in which it is exposed to the vapours of ammonium carbonate; the cork of the bottle may be protected with a double sheet of filter-paper, between which and the cork a lump of ammonium carbonate is placed. The yield of "cupferron" is 80–90% of the theoretical amount. Even with the present high prices of materials and labour, "cupferron" may be made in the laboratory at a cost considerably less than the pre-war price of the product.

—T. H. P.

Monomethylamine; Preparation of — from chloropierin. P. F. Frankland, F. Challenger, and N. A. Nicholls. Chem. Soc. Trans., 1919, 115, 159–162.

CHLOROPIERIN is readily obtainable in large quantities and is a suitable raw material for the commercial preparation of methylamine according to the equation $\text{CCl}_3\text{NO}_2 + 12\text{H} = \text{CH}_3\text{NH}_2 + 3\text{HCl} + 2\text{H}_2\text{O}$. When iron filings and hydrochloric acid are employed for the reduction, the composition of the product varies according to the conditions of the experiment and when the reagents are used in the theoretical proportions necessary to prevent the formation of iron hydroxide, namely $6\text{Fe} : 9\text{HCl} : 10\text{CCl}_3\text{NO}_2$, a large percentage of ammonium chloride is produced. By decreasing the proportion of acid to about one-fortieth of the theoretical proportion as recommended by Krause (this J., 1916, 1081) for the reduction of nitroparaffins, the yield of methylamine hydrochloride is very satisfactory and the ammonium chloride does not exceed 4%. 500 grms. of fine iron filings is gradually shaken into a large jar containing 2500 c.c. of water and 60 c.c. of concentrated hydrochloric acid, clogging of the filings being avoided. The mixture is stirred mechanically and 250 grms. of chloropierin is introduced in the course of 1½ hours, the jar being cooled with water. Efficient stirring is essential, in order to prevent the chloropierin being enclosed in masses of iron filings or hydroxide. The temperature is allowed to rise to 60° C. and maintained at that for about 3 hours, when the odour of chloropierin should have disappeared. The mixture is then added gradually to a boiling solution of sodium hydroxide and the methylamine is distilled over with steam into hydrochloric acid. The solution of the hydrochloride is evaporated, the yield being 95–5% and the product containing only 3–5% of ammonium chloride.—J. F. B.

Ether; Impurity in — giving blue coloration with benzidine. F. Weehuizen. Pharm. Weekblad, 1919, 56, 301–303.

ETHER used for analytical purposes gives in some cases a blue coloration with hydrogen peroxide and benzidine. A few pieces of caustic potash kept in the ether for a time, with occasional shaking, will remove the impurity.—W. S. M.

Mercury; Estimation of — in mercury salicylate. A. Costantino. Giorn. Farm. Chim., 1918, 67, 7–12. Chem. Zentr., 1919, 90, II., 4–5.

0.25 GRM. of mercury salicylate is dissolved in 2 c.c. of concentrated sulphuric acid, heated for about 6 mins. in a porcelain basin on a water-bath, and diluted to 160 c.c. with water. The solution is then electrolysed for 14 mins. in a platinum dish, using a rotating platinum anode and a current of 5 volts and 6 amps. The deposit of mercury is washed,

without stopping the current, with distilled water, alcohol, and ether, and dried in a desiccator. In place of the platinum dish, a mercury cathode may be employed, in which case the volume of the solution should not exceed 30 c.c., and the current should be 7–10 volts and 3 amps.—L. A. C.

Zinc oxide; Lead in pharmaceutical —. W. D. Collins and W. F. Clarke. J. Ind. Eng. Chem., 1919, 11, 133–139.

For a short time after the beginning of the war, the zinc oxide produced in the United States contained excessive quantities of lead; several samples examined by the authors contained more than 0.2% of lead. At the present time, however, the amount of lead present is usually less than 0.01%. The U.S.P. method for the detection of heavy metals will not detect less than 0.05% of lead in zinc oxide.

—W. P. S.

PATENTS.

Ethylidene diacetate; Manufacture of — [from acetylene]. Soc. Chim. des Usines du Rhône, anc. Gillard, P. Monnet et Cartier, Paris. Eng. Pat. 112,765, 29.10.17. (Appl. 15,755/17.) Int. Conv., 9.12.16.

ACETYLENE is absorbed in glacial acetic acid in the presence of sulphonic acids and mercuric acetate. Sulphonic acids of the aromatic series or aliphatic sulphonic acids, such as sulphaacetic acid or methionie acid, may be employed as catalysts and, there being no formation of sulphuric acid during the reaction, no appreciable formation of tar nor decomposition of the ethylidene diacetate occurs. Example: 40 parts of mercuric oxide is dissolved in 800 of glacial acetic acid at about 70° C. and a hot solution of 50 parts of β -naphthalenesulphonic acid in 200 of glacial acetic acid is run in, while stirring. This solution will absorb 200 parts of acetylene during a period of 2 hours at 70° C.

—J. F. B.

Dimethyl sulphate; Preparation of —. W. N. Haworth and J. C. Irvine, St. Andrews. Eng. Pat. 122,498, 31.1.18. (Appl. 1796/18.)

DIMETHYL ether and sulphur trioxide are passed simultaneously in equimolecular proportions into a considerable quantity of a solvent, which may consist of pre-formed dimethyl sulphate. The liquid is stirred during the passage of the gases and is cooled by a water jacket or coil. The sulphur trioxide may conveniently be employed in the form of the dilute vapours issuing from the contact chamber in the manufacture of sulphur trioxide by the contact process. The formation of dimethyl sulphate is continuous and there are no by-products, but it is essential that the reacting gases be perfectly dry and free from alcohol vapour. The crude dimethyl sulphate withdrawn from the apparatus is treated with iron filings to reduce any excess of sulphur trioxide, and then rectified under diminished pressure.—J. F. B.

CC-Dialkyl, CC-diallyl and CC-alkylaryl barbituric acids; Manufacture of easily soluble compounds of the —. H. R. Napp, London. From F. Hoffmann-La Roche & Co., Basle, Switzerland. Eng. Pat. 122,778, 20.6.18. (Appl. 10,180/18.)

EASILY soluble compounds of CC-dialkyl-, diallyl-, and alkylaryl-barbituric acids are obtained by combining the free acids with alkylamines, for instance diethylamine or dimethylamine, by adding rather more than the theoretical quantity of alkylamine to the free acid, so that the latter is dissolved, and then evaporating off the excess of alkylamine. The

products are more powerful hypnotics than the free substituted barbituric acids and are much more stable in aqueous solution than the sodium salts of these acids.—J. F. B.

Lignin-producing substances. Ger. Pat. 309,551. See V.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Metol (N-methyl-p-aminophenol sulphate); Preparation of —. R. N. Harger. J. Amer. Chem. Soc., 1919, 41, 270–276.

In the preparation of metol from quinol and methylamine by Merck's process (Ger. Pat. 260,234; this J., 1913, 807), better results are obtained by using a lower temperature and a much shorter period of heating than those specified. By heating 20 grms. of quinol with 2 equivalents of aqueous methylamine (10 N) for 4 hours at 200° C. in a sealed tube, then pouring the product into a quantity of sulphuric acid (1:20) equivalent to the methylamine used, concentrating, and cooling with ice, a total yield (including that recovered from the mother liquor) of 73% of the theoretical quantity of metol was obtained. Metol begins to char at 245° C. and melts with decomposition at 250°–260° C. It is soluble in 6 parts of boiling water and in 20 parts of water at 25° C. A solution of metol gives an intense purple coloration with mercuric acetate, and this reaction may be used to determine metol colorimetrically. Quinol and salts of p-aminophenol do not give a coloration with mercuric acetate; amidol (2,4-diaminophenol) also gives a purple colour, but this is changed to pink on addition of acetic acid, whereas the purple colour due to metol is not affected by acetic acid.

PATENTS.

Colour photography; Subtractive and additive —. W. V. D. Kelley, Brooklyn, Assignor to Prizma, Inc. U.S. Pat. 1,278,162, 10.9.18. Appl., 8.2.17.

In a four-colour process for cinematograph film the colours of the taking screens are in two complementary pairs; in printing a positive from the four-colour negative record a film coated on both sides may be used, two of the colour records being printed on one side of the film, and two on the other side of the film in register with the first two and each of the colour records having its complementary opposite to it. The positives on one side of the film are stained one suitable colour and those on the other side the complementary colour. For example, if the taking screens are red and yellow and their respective complementaries green and blue, the positives on one side of the film are from the red and yellow colour records and are stained a blue-green, and those on the other side are from the green and blue records and are stained an orange-red, the yellow colour record being opposed by the blue and the red by the green. Instead of using film coated on both sides, a single-coated film may be used for the first set of positives, which is then recoated for the second set of positives.

—B. V. S.

[*Photographic*] *colour-printing.* D. F. Comstock, Brookline, Assignor to Kalmus, Comstock and Wescott, Inc., Boston, Mass. U.S. Pat. 1,283,087, 29.10.18. Appl., 31.7.16.

In multicolour photographic processes where two or more negatives are taken through two or more coloured screens, a certain amount of inaccuracy

of colour rendering results, if all the negatives have to be developed for the same length of time, by reason of the differences in steepness of gradation of the negatives produced by exposure to lights of different wave-lengths; the light of longer wave-length gives the steeper gradation. For example if red and green screens are used the negative through the red screen will have a steeper gradation than that through the green screen; this difference will normally be repeated in the positives and it will not therefore be possible to get a correct colour balance through the whole scale of tones of the picture, there being either too much green in the shadows or too much red in the high lights or both. This difficulty is obviated by printing the positives by lights differing in wave-length in the opposite direction to that of the taking screens, for instance, printing the red negative by a violet light and the green negative by a blue light, the difference in gradation of the positives thus counterbalancing that of the negatives.—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

Nitrocellulose solutions; Relations between the viscosity of — and the nitration process, with special reference to wood cellulose. G. Leysieffer. Koll. Chem. Beih., 1918, 10, 145–178.

The influence of the various factors operating during the nitrating process has been determined on the viscosity of acetone solutions of nitrocelluloses prepared from pure cellulose obtained from deal (α -cellulose, 80.4; β -cellulose, 6.8; γ -cellulose, 12.8%; ash, 0.20%; fat, 0.44%). It is found that the same value of the viscosity is always obtained provided all these factors are kept constant. The greater the nitric acid content of the nitrating acid the higher is the viscosity. When, however, the amount of nitric acid equals or exceeds that of the sulphuric acid, smaller values are found for the viscosity. Increasing the water content of the mixed acid from 0 to about 11% causes an increase in the viscosity, provided the nitric acid content is less than the sulphuric acid content. Otherwise, and if the water content exceeds the above limit, smaller values of the viscosity are obtained. Nitration at temperatures below 0° C. produces nitrocelluloses having high viscosity values. Insufficiently nitrated celluloses (5–30 minutes) show variable values of the viscosity. This increases as long as the nitrogen content increases, but prolonged nitration results in decreased viscosity. Acetone solutions of nitrocelluloses become more mobile with keeping. The kind, method of preparation, and previous treatment of the cellulose are of great influence on the viscosity. A high content of γ -cellulose causes increased viscosity in the nitro-derivative. Nitrocelluloses from cotton cellulose show higher viscosities than those from wood cellulose.—C. S.

Sucrose; Nitration of —: sucrose octanitrate. E. J. Hoffman and V. P. Hawse. J. Amer. Chem. Soc., 1919, 41, 235–247.

NITRATION of sucrose in the cold by sulphuric and nitric acids yields a mixed product, and evaporation of the alcoholic solution of the latter at the ordinary temperature gives sucrose octanitrate, $C_{12}H_{14}O_{28}(NO_3)_8$, m.pt. 85.5° C., $[\alpha]^{20}_D = +50.05^\circ$; this compound shows normal cryoscopic behaviour in nitrobenzene and shows no sign of decomposition when heated gradually from 33° to 87° C. in about two hours. Sucrose octanitrate in explosive mixtures may be estimated by means of its rotatory power and nitrogen content (15.95%). (See also J. Chem. Soc., 1919, 1, 148.)—T. H. P.

Combustion of hydrogen. Comparison with explosives. Sabatini. See IIa.

XXIII.—ANALYSIS.

Filter-paper pulp; Use of — in analysis. O. Hackl. Chem.-Zeit., 1919, 43, 70—71.

By adding paper pulp to a solution containing a precipitate, the filtration of the mixture is often facilitated. The pulp is particularly useful in the case of barium sulphate, calcium oxalate, sulphur, and ferric and aluminium hydroxides. On the other hand, it should not be used when it is desired to separate a silica precipitate from a solution containing aluminium salts; the latter appear to have an astringent action on the fibres and the rate of filtration is retarded. The presence of the pulp in a mixed precipitate of aluminium and ferric hydroxides has the further advantage that, after ignition, the oxides are in a fine state of division and are readily soluble in hydrochloric acid. The pulp should not, however, be used when the hydroxides are to be re-dissolved in hydrochloric acid, since the latter attacks the fibres and much organic matter passes into solution.—W. P. S.

Platinum; Replacement of — by an alloy in apparatus for electrolytic analysis. P. Nicolardot and J. Boudet. Bull. Soc. Chim., 1919, 25, 84—88. (See this J., 1918, 750 A.)

For the manufacture of cathodes, the authors recommend the use of an alloy of gold and copper in the proportion of 9:1, in place of platinum. Such a cathode, weighing 23.5 grms., only lost 0.001 grm. in weight during twenty estimations of different types. Anodes may be prepared from the same alloy but should be electroplated with a thin layer of platinum. The cost of such electrodes is only about one-third that of platinum electrodes, reckoned at pre-war prices.—W. G.

Copper; A very sensitive reaction for —. Application to the analysis of ashes and of arable soils. L. Maquenne and E. Demoussy. Comptes rend., 1919, 168, 489—492.

When potassium ferrocyanide is added to a solution of a copper salt acidified with hydrochloric acid and containing zinc to the extent of four times that of the copper, a blue precipitate separates. This test is a very delicate one for copper in the absence of iron, manganese, or nitric acid. It may be used for the estimation of copper in plant ashes as follows:—0.05—0.2 grm. of the ash is heated in a quartz crucible, with a few drops of nitric acid and a slight excess of sulphuric acid, then boiled for 20 mins. with 1.5 c.c. of 5% sulphuric acid, water being added from time to time. The liquid is transferred to a small, stoppered tube and centrifuged, the supernatant liquid (2.5 c.c.) then being submitted to electrolysis. The cathode is washed with 3 drops of nitric acid and a little water, the liquid is evaporated to dryness, and the residue calcined, and then dissolved in 2 c.c. of dilute hydrochloric acid. Two drops of a 1.04% solution of zinc sulphate and 1 drop of 10% potassium ferrocyanide solution are added and the whole is again centrifuged. The blue tint of the precipitate is compared against standards and by this means a close approximation to the weight of copper in the original ash is obtained. A similar process is used for the examination of soils, 5 grms. of the soil being taken.—W. G.

Iodotannic reagent; The red —. D. E. Tsakalotos and D. Dalmas. Bull. Soc. Chim., 1919, 25, 80—84.

THE sensitiveness of the iodotannic reaction (this J., 1918, 750 A) is much greater than that of starch-iodide especially for dilute solutions of iodine, except in the presence of potassium iodide, which weakens the former reaction, whilst enhancing the sensitiveness of the latter. An excess of either iodine or tannin inhibits the formation of the red colour in the iodotannic reaction.—W. G.

Phosphoric anhydride; Estimation of — as ammonium phosphomolybdate. J. Clarens. Bull. Soc. Chim., 1919, 25, 87—90. (See also this J., 1918, 352 A.)

A REPLY to Villiers (this J., 1918, 532 A).—W. G.

Analysis; Microelementary — of [organic] compounds containing sulphur, halogens, and oxidised nitrogen. Double combustion. C. Grünacher. Helv. Chim. Acta, 1919, 2, 76—84.

A "UNIVERSAL tube" suitable for the estimation of the carbon and hydrogen in any organic substance is filled from the boat onwards with (1) silver roll, (2) a mixture of equal parts of copper oxide and lead chromate, (3) silver roll, and (4) lead peroxide. The lead peroxide, in a layer 5 cm. in length, is maintained at a temperature between 175° and 180° C. by enclosing this portion of the combustion tube in a copper chamber containing boiling aniline. Arrangements of apparatus are described whereby the estimation of the nitrogen or of the carbon and the hydrogen in two substances in two tubes side by side can be performed simultaneously.—C. S.

Organic substances; Micro-elementary analysis of —. J. V. Dubsky. Helv. Chim. Acta, 1919, 2, 63—75.

A DESCRIPTION of the methods of estimating carbon, hydrogen, and nitrogen by micro-analysis. The advantages of a new micro-balance are enumerated.—C. S.

Selenium; Is — present in the vegetable and animal organism? [Detection of selenium.] R. Fritsch. Z. physiol. Chem., 1919, 104, 59—64.

THE author was unable to detect the presence of selenium in thirty-five samples of spinach, corn, clover, potatoes, and bones. The method adopted consisted of incinerating the plant in the presence of sodium carbonate and sodium nitrate and finally obtaining any selenium present as a solution of selenious acid in concentrated sulphuric acid; in this solution, the presence of selenium was detected by the green to bluish-green coloration with codeine or the intense yellow coloration with colchicine. Test experiments showed that 2—0.5 mgrm. of selenious acid could be detected in 30—50 grms. of plant material in this manner. Selenium does not appear to be present in urine or bones.—H. W.

Methoxyl groups; Determination of — in substances containing sulphur. M. Hönl. Monatsh. Chem., 1918, 39, 871—872.

THE method employed by Hönl and Spitzer (see this J., 1918, 502 A) was erroneously described as a modification of that of Kirpal and Bühn (this J., 1914, 570). In reality an entirely different principle is involved since a solution of silver nitrate in pyridine (which absorbs both methyl iodide and

hydrogen sulphide) is used in the one case whereas pure pyridine (which absorbs only methyl iodide) is used in the other.—H. W.

Asphaltic substances in petroleum. Prozynski. See IIa.

Benzene. Jones. See III.

Chlorinated benzene. Jones. See III.

Dimethylaniline. Jones. See III.

Tartrates. Curtman and Harris. See VII.

Silica bricks. Le Chatelier and Bogitch. See VIII.

Resins for soap making. Goldschmidt and Weiss. See XII.

Fatty acids from varnish oils and varnishes. Pearce. See XIII.

Separating resins. Wolff. See XIII.

Sulphuric acid in leather. Immerheiser. See XV.

Leather substitutes. Iauffmann. See XV.

Pressed yeast. Janke. See XVIII.

Cow and buffalo milk. Todd. See XIXa.

Crude fibre determination. Spears. See XIXa.

Nucleic acids. Feulgen. See XX.

Geraniol in citronella oil. De Jong. See XX.

Organic reagents. Marvel and Kamm. See XX.

Mercury in mercury salicylate. Costantino. See XX.

Impurity in ether. Weehuizen. See XX.

Sucrose octanitrate. Hoffman and Hawse. See XXII.

PATENT.

Methane; Estimation of — in mine air, and of other gases in gaseous mixtures. F. Krüger, Danzig-Langfuhr, O. Reinkober, Berlin, and H. Riegger, Ostrach. Ger. Pat. 309,627, 20.6.14.

A METHOD for estimating methane in mine air or of other gases in gaseous mixtures, depends upon the property of methane and other gases of absorbing ultra-red rays. The difference in intensity of the rays from a suitable source of radiation before and after passing through the gas is measured by means of a thermopile, bolometer, or selenium cell. —L. A. C.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Aeschbach A.-G. Mixing and kneading machines. 7022. Mar. 20. (Switzerland, 20.3.18.)

Antrobus. Furnaces. 7898. Mar. 20.

Berry. 6716. See X.

Burdon, and Burdons, Ltd. Apparatus for liquid-fuel firing of steam-boilers. 7943. Mar. 29.

Calinaud. Centrifugal liquid-separators. 6726. Mar. 18. (France, 4.4.18.)

Carter and Travis. Means for preventing loss of heat by radiation from water pipes, engine cylinders, etc. 7266. Mar. 24.

Castleman. Filter for cleaning and cooling air or gas. 7503. Mar. 26.

Constantinesco. Method of pulverising or atomising liquids. 7836. Mar. 28.

Cruse. Pulverisation of materials, and collection and grading of pulverised materials. 7106. Mar. 21.

Davenport Engineering Co., and Gill. Cooling-towers etc. for cooling water etc. 7264. Mar. 24.

Davis. Apparatus for drying or cooling coal, limestone, etc. 7250. Mar. 24.

Fenton and Wright. Furnace roofs, walls, coke-oven doors, boiler bridges, etc. 7363. Mar. 24.

General Chemical Co. Apparatus for absorbing gases from gaseous mixtures. 7871. Mar. 28. (U.S., 3.11.17.)

Grocott. 6929. See X.

Hush. Mills or machines for grinding or pulverising ore etc. 7584. Mar. 26.

Lumsden. Grinding-machines. 7364. Mar. 24.

McOustra. Condensing apparatus. 7581. Mar. 26.

Mallet. Method of producing intimate mixture of liquids or causing reaction of liquid on pulverulent substance. 7867. Mar. 28. (France, 3.6.18.)

Matter. Process for concentrating or evaporating liquids. 6640. Mar. 17. (Switzerland, 28.3.18.)

Melland and Nield. Furnaces. 6831. Mar. 19.

Morison. Steam-condensing apparatus. 7630. Mar. 26.

Smidth & Co. Ball-mills. 7467. Mar. 25. (Sweden, 27.3.18.)

Smith. Edge-runner, pan, etc. mills. 7896. Mar. 22.

Smith. Steam-generators and furnaces. 7896. Mar. 29.

Sturgeon. Centrifugal separating-machines. 6611. Mar. 17.

Summers and Whittard. Rotary furnaces, retorts, etc. 7052. Mar. 21.

Western Electric Co. (Western Electric Co.). Producing vacua. 6961. Mar. 20.

Wirth-Frey. Utilising heat of liquids. 7118. Mar. 21. (Switzerland, 12.4.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

2520 (1918). Kirke. Gas-fired boilers. (124,016.) Mar. 26.

3054 (1918). Hope. Apparatus for drying sand and similar granular material. (124,244.) Apr. 2.
 4443 and 14,933 (1918). Hutchins. Means for treating gases with liquids. (124,045.) Mar. 26.
 4561 (1918). Dunsford and Linley. Refrigerating-apparatus. (124,064.) Mar. 26.
 4776 (1918). Rouse. Manufacture of agglomerates of various materials and their utilisation. (124,262.) Apr. 2.
 4853 (1918). Harbord. *See* X.
 5021 (1918). Wolff. Manufacture of useful substances from organic waste products. (121,576.) Apr. 2.
 5085 (1918). Dunker. Apparatus for humidifying or filtering air or other gases. (124,287.) Apr. 2.
 7959 (1918). Reynard. Method of and means for effecting rapid crystallisation of substances in solution. (124,324.) Apr. 2.
 9760 (1918). Richards. Filters. (116,725.) Mar. 26.
 16,440 (1918). Sharp and Gardiner. Mixing or agitating appliances. (124,386.) Apr. 2.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

Allen and Clements. Gas-producers. 7469. Mar. 25.
 Antrobus. Treatment of fuels for obtainment of by-products therefrom. 7899. Mar. 29.
 Bellby. Carbonisation of coal, shale, peat, etc. 7446. Mar. 25.
 British Thomson-Houston Co. (General Electric Co.). X-ray apparatus. 7749. Mar. 27.
 British Thomson-Houston Co. (General Electric Co.). Electron discharge apparatus. 7851. Mar. 28.
 British Thomson-Houston Co. (General Electric Co.). Manufacturing electric incandescent lamps etc. 7960. Mar. 29.
 Burdon, and Burdons, Ltd. 7943. *See* I.
 Castleman. 7503. *See* I.
 Cole. Oil-fuel burners. 7696. Mar. 27.
 Cortesey. Generation and/or treatment of gas. 7559. Mar. 26.
 Crick. Arc lamps. 7102. Mar. 21.
 Davis. 7250. *See* I.
 Fenton and Wright. 7363. *See* I.
 Garbarini. Electric lamps. 6743. Mar. 18. (France, 3.7.18.)
 George. Quartz mercury-vapour lamps. 7830. Mar. 28. (France, 24.4.18.)
 George. Mercury lamps. 7841. Mar. 28. (France, 8.7.18.)
 Grocott. 6929. *See* X.
 Hall. Electric lamps. 7763. Mar. 28.
 Harger. Gas-producers. 7182. Mar. 22.
 Helps. Manufacture, utilisation, and combustion of fuel. 6956. Mar. 20.
 McCoulough. Filament electric lamp. 7167. Mar. 22.
 Mayer, and Welsbach Light Co. 6791. *See* VIII.
 Nelson. Distillation and carbonisation of wood. 7353. Mar. 24.

Pearse (Kennedy). Rotary retorts, and destructive distillation of carbonaceous material therein. 7607. Mar. 26.

Seymour. Combustion of fuel. 7737. Mar. 27.
 Smoot. Regulation of pressure or volume of gases. 7502. Mar. 25. (U.S., 25.3.18.)
 Thiry. Distilling, carbonising, and gasifying coal etc. 7590. Mar. 26.
 Vello. Electric lamps. 7336. Mar. 24. (Spain, 23.3.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

18,911 (1917). Thaberg. Process of producing gas from moist fuel in furnaces, gas-producers, and similar apparatus, and of simultaneously recovering by-products, and apparatus relating thereto. (112,443.) Apr. 2.
 18,963 (1917). Nelson. Low-temperature distillation of coal, shale, and the like. (124,231.) Apr. 2.
 2462 (1918). Freeman. Carbonising or distillation apparatus. (124,015.) Mar. 26.
 2520 (1918). Kirke. *See* I.
 3282 and 11,318 (1918). Rew. Manufacture of gas. (124,247.) Apr. 2.
 4237 (1918). Bellby. Carbonisation of coal, shale, peat, wood, and other bituminous or organic materials, and apparatus therefor. (124,039.) Mar. 26.
 4543 (1918). Maxon. Process and apparatus for the combustion of gas. (124,052.) Mar. 26.
 4925 (1918). Spicer (Wells). Carbonisation of wood and the like. (124,274.) Apr. 2.
 5021 (1918). Wolff. *See* I.
 5085 (1918). Dunker. *See* I.
 5511 (1918). Lamplough, and Oil Extractors, Ltd. Processes and apparatus for the distillation of coal. (124,294.) Apr. 2.
 5865 (1918). Marks (General Engineering Co.). Devices for burning liquid fuel. (124,303.) Apr. 2.
 6175 (1918). Alliaia. Control and regulation of combustion in producer-gas and other gas furnaces. (115,423.) Mar. 26.
 6574 (1918). Grimaldi. Combustible block or tablet. (124,310.) Apr. 2.
 6779 (1918). Wood. Drying fuel supplied to boiler furnaces or the like. (124,314.) Apr. 2.
 10,823 (1918). Leadbeater. Means or method of treating peat so as to render it more adaptable or useful as a fuel. (124,348.) Apr. 2.
 14,953 (1918). Wilputte. Burner nozzles for coke ovens and the like. (119,464.) Mar. 25.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

Ashcroft. 7120. *See* XX.
 Gros et Bouchardy. Manufacture of mono- and di-nitrophenols. 7300. Mar. 24. (Switzerland, 23.3.18.)

COMPLETE SPECIFICATION ACCEPTED.

14,402 (1915). Lapworth and Morris. Method of isolating sulphonic acids in the form of salts from the products obtained on sulphonating carbon compounds. Mar. 26.

IV.—COLOURING MATTERS AND DYES.

APPLICATION.

Gros et Bouchardy. 7298. *See* XXII.

COMPLETE SPECIFICATIONS ACCEPTED.

- 14,367 (1915). Graesser and Titherley. *See* XXII.
 16,607 (1915). Green. *See* XXII.
 17,525 (1915). MacDonald. *See* XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

- Evans, and Saundevan, Ltd. Fireproofing fabrics. 7094. Mar. 21.
 Farrell. Textile etc. drying-cylinders. 7073. Mar. 21.
 McKechnie, Ryan, and Vickers, Ltd. Fabrics for air-ships. 7405. Mar. 25.
 Mellersh-Jackson (Arkell Safety Bag Co.). Wrapping or packing paper. 6619. Mar. 17.
 Robinson-Bindley, Dulcken, and Weller. Production of substitutes for celluloid, vulcanite, etc. 7109. Mar. 21.
 Thompson. Paper-making machines. 7873. Mar. 28.

COMPLETE SPECIFICATIONS ACCEPTED.

- 13,689 (1915). Williams, and North British Rubber Co. Balloon fabrics and the like. Mar. 26.
 13,690 (1915). Williams, and North British Rubber Co. Manufacture of balloon fabrics and the like. Mar. 26.
 14,157 (1918). Ashourkoff and Gaszynski. Machines for separating incrustations and other refuse from crushed or broken fibrous materials. (124,376.) Apr. 2.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

- Gibson. Finishing-composition for yarns and fabrics. 7239. Mar. 24.
 Henshilwood and Thornber. Mechanism for stretching and guiding fabrics in bleaching, dyeing, finishing, etc. machines. 7399. Mar. 25.
 Hunt. Apparatus for bleaching open fabrics. 6817. Mar. 19.
 Samuel. Machines for printing fabrics etc. 6926. Mar. 20. (France, 16.5.18.)

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

- Brownlee, Chance and Hunt, Gidden, and Ragg. Manufacture of oxide and carbonate of zinc. 7214. Mar. 22.
 Crosfield and Sons, and Wheaton. 7119. *See* XIX.
 Davis. 7250. *See* I.
 Ekeley and Stoddard. Method of obtaining pure tungstates. 6999. Mar. 20.
 Fricker. Manufacture of zinc oxide. 7966. Mar. 29.
 General Chemical Co. Apparatus for production of nitric acid. 7869. Mar. 28. (U.S., 3.11.17.)
 General Chemical Co. Treating gases containing carbonic oxide. 7870. Mar. 28. (U.S., 3.11.17.)
 General Chemical Co. Apparatus for synthetic production of ammonia. 7872. Mar. 28. (U.S., 3.11.17.)

Goold (Balfour-Guthrie Investment Co.). Method of producing cyanogen and ammonia. 7403. Mar. 25.

Greenwood and Tate. Electric heaters for apparatus for synthetic production of ammonia etc. 7323. Mar. 24.

Mellersh-Jackson (Sperry). Producing lead salts. 7131. Mar. 21.

COMPLETE SPECIFICATIONS ACCEPTED.

17,541 (1915). Tyrer. Process for removing nitrous and nitric acids from sulphuric acid. Apr. 2.

4272 (1918). Mirza. Zinc oxide furnaces or kilns. (124,038.) Mar. 26.

4834 (1918). Harbord. *See* X.

13,873 (1918). Larson and Bergman. Production of pure aluminium hydroxide and ammonium sulphate. (120,550.) Mar. 26.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Bey and Bundy. Method of applying decorative treatment to enamelled metal articles. 7307. Mar. 24.

Mayer, and Welsbach Light Co. Manufacture of clay rings for inverted incandescent gas mantles. 6791. Mar. 18.

Muggeridge, Straughan, and Straughan. Process for manufacture of strengthened glass. 7095. Mar. 21.

Tuhten. Process of decorating earthen etc. ware. 7373. Mar. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

2252 (1918). Norton Co. Aluminous abrasive. (113,957.) Mar. 26.

4922 (1918). Kiltson. Furnaces for glass manufacture and like purposes. (124,273.) Apr. 2.

5821 (1918). Pickard, Sherlock, Callcott, and Smith. Cement for mending ceramic, glass, and other articles. (124,302.) Apr. 2.

6057 (1918). Ghijsen, and Naaml. Vennoots. Vitrite Works. Glass-melting furnaces. (124,307.) Apr. 2.

11,420 (1918). Clegg. Machines for manufacturing glass-ware. (124,356.) Apr. 2.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Clarke. Manufacturing dense or compact concrete etc., and forming structures thereof. 7209. Mar. 22.

Cooper, Millard, and Robertson. Building brick or block, and method of manufacturing same. 7832. Mar. 28.

COMPLETE SPECIFICATION ACCEPTED.

5821 (1918). Pickard and others. *See* VIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Bastian. Determining decalcant point of steel. 7482. Mar. 25.

Bates and Newman. 7460. *See* XI.

Bates and Newman. Ebonising metals. 7461. Mar. 25.

Berry. Apparatus for drying slag and removing moisture from ores, stone, etc. 6716. Mar. 18.

Bingham. Method of protecting metallic vessels from damage. 7555. Mar. 26.

Blaiberg. 7142. *See* XI.

Bloxam (Soc. Anon. des Usines Giullini). Process for increasing hardness, tenacity, and ease of working of metals. 7111. Mar. 21.

Clarke and Gregg. Alloy of aluminium. 7128. Mar. 21.

Cowper-Coles. Process for sherardising. 7636. Mar. 26.

Danson. Apparatus for cleaning tuyères and/or tapping-holes of blast, cupola, Siemens, etc. furnaces. 7759. Mar. 28.

Gathmann. Apparatus for teeming ingot moulds. 6967. Mar. 17.

Gathmann. Method of teeming ingot moulds. 6968. Mar. 17.

Grocott. Melting-furnaces burning producer gas. 6929. Mar. 20.

Guise, and Redditch Electro Plating Co. Rust-preventing process for needles, hat-pins, etc. 6825. Mar. 19.

Hush. 7584. *See* I.

Joly. Method of separating alloys or mixtures of metals. 7767. Mar. 28.

Leopard. Solder for aluminium and its alloys. 6985. Mar. 20.

Marcotly, and Soc. Anon. de Vedrin. Roasting-furnaces for sulphurous ores. 6739. Mar. 18.

Minerals Separation, Ltd., and Wood. Concentration of ores. 7956. Mar. 29.

Mordey. Electro-magnetic separation or concentration of minerals. 7848. Mar. 28.

Rogers. Steel for resisting corrosion and high temperatures. 6824. Mar. 19.

Rondelli. Process of oxidising iron or steel surfaces. 7617. Mar. 26.

Smith. Electric arc welding. 7370. Mar. 25.

Stabilimenti Biak-Pouchain. Metal alloy containing manganese. 6986. Mar. 20.

COMPLETE SPECIFICATIONS ACCEPTED.

4228 (1915). Hadfield and Jack. Manufacture of metal ingots. Apr. 2.

19,170 (1917). Leech, Slater, and Slater. Electrolytic preparation of metals or alloys in the form of paste or sludge. (124,006.) Mar. 26.

2653 (1918). White. Process for the recovery of brass from foundry ash and the like. (124,019.) Mar. 26.

4853 (1918). Harbord. Muffled chamber suitable for use as a roasting furnace or kiln. (124,265.) Apr. 2.

4554 (1918). Harbord. Roasting complex zinc sulphide ores or concentrates particularly in conjunction with the manufacture of sulphuric acid. (124,266.) Apr. 2.

5023 (1918). Daponte and Newman. Zinc vapour rustproofing. (124,283.) Apr. 2.

9226 (1918). Hazard and Morris. *See* XI

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Adkins and Austin. Electric cells or batteries. 7179. Mar. 22.

Bates and Newman. Electrolyte for copper deposition. 7460. Mar. 25.

Blaiberg. Electrodes for electric arc welding. 7142. Mar. 22.

Dorrian. Electrical primary cells. 6942. Mar. 20.

Greenwood and Tate. 7323. *See* VII.

Gros et Bouchardy. Manufacture of ozone. 7290. Mar. 24. (Switzerland, 23.3.18.)

Grove. Non-acid mixture for charging accumulator cells. 7578. Mar. 26.

Lewis and Quain. 7744. *See* XIX.

Morgan Crucible Co., and Speirs. Electrically-heated furnaces. 6634. Mar. 17.

Oldham and Oldham. Galvanic batteries. 6781. Mar. 18.

Osborne. Electric muffles and furnaces. 6722. Mar. 18.

Pattison (General Research Laboratories). 6738. *See* XIX.

Smith. 7370. *See* X.

COMPLETE SPECIFICATIONS ACCEPTED.

19,170 (1917). Leech and others. *See* X.

4530 (1918). Leitner and Exley. Manufacture of electric accumulators. (124,050.) Mar. 26.

4868 (1918). Ajax Metal Co. Method and apparatus for electric heating by high-frequency currents. (119,220.) Mar. 26.

5479 (1918). Matsushima. Apparatus for electrolyzing salt solution. (114,623.) Mar. 26.

9226 (1918). Hazard and Morris. Electrodes particularly for use in electric smelting and like purposes. (124,116.) Mar. 26.

11,464 (1918). Horii. Process of resuscitating spent electric dry cells. (124,137.) Mar. 26.

14,530 (1918). Pearson, and General Electric Co. Electric accumulators. (124,378.) Apr. 2.

XII.—FATS; OILS; WAXES.

COMPLETE SPECIFICATION ACCEPTED.

5167 and 5635 (1918). Carper and Tulloch. *See* XIV.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Buckley. Plastic composition. 7319. Mar. 24.

Morley. Red waterproof marking-ink. 7371. Mar. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

2272 (1918). Dior. Process for the manufacture of synthetic resins. (124,010.) Mar. 26.

4458 (1918). Benneche. Paint. (124,046.) Mar. 26.

10,668 (1918). Grozier. Process for the reclaiming of used printers' roller composition and analogous substances or compositions and apparatus therefor. (121,941.) Apr. 2.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

Buckley. 7319. *See* XIII.

Chatterley. Reinforced rubber compound. 6543. Mar. 17.

McKechie and others. 7465. *See* V.

Robinson-Bindley and others. 7109. *See* V.

* COMPLETE SPECIFICATIONS ACCEPTED.

13,689 and 13,690 (1915). Williams, and North British Rubber Co. *See* V.
 4944 (1918). Dunlop Rubber Co., and Twiss. Vulcanisation of rubber and similar materials. (124,276.) Apr. 2.
 5167 and 5635 (1918). Carper and Tulloch. Preparation of solvents for india-rubber and animal fats. (124,072.) Mar. 26.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATIONS.

Seymour-Jones. Apparatus for treatment of hides and skins. 7291. Mar. 24.
 Waley. Composition for treating leather. 7346. Mar. 24.

COMPLETE SPECIFICATIONS ACCEPTED.

4347 (1918). Abrahamsen. *See* XX.
 11,375 (1918). Rast-Ruttimann. Waterproof leather substitute and process for making the same. (117,628.) Mar. 26.

XVI.—SOILS; FERTILISERS.

APPLICATION.

Grossmann. Manufacture of manure from sewage sludge. 7680. Mar. 27.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATION.

MacCallum. Substitute for whisky, brandy, rum, etc. 6939. Mar. 20.

COMPLETE SPECIFICATIONS ACCEPTED.

1195 (1918). Jensen (Magne). Pure-culture apparatus for yeast, mucorini, moulds, bacilli, and micro-organisms. (124,237.) Apr. 2.
 8925 (1918). Block. Manufacture of non-alcoholic malt beer. (124,330.) Apr. 2.
 12,205 (1918). Dupire. Process for the extraction of the yeast contained in fermented molasses. (123,711.) Mar. 26.
 12,255 (1918). Dupire. Process for the extraction of yeast from the fermented molasses. (124,364.) Apr. 2.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Bates. Preparation for destroying blight. 7462. Mar. 25.
 Calder's-Margarine Co., and Clayton. Manufacture of margarine etc. 6938. Mar. 20.
 Crosfield and Sons, and Wheaton. Base-exchanging compound, and its employment in purification and/or softening of water. 7119. Mar. 21.
 Ferguson and Peyton. Process for preservation and treatment of meat, fish, jam, etc. 7236. Mar. 24.
 Grossmann. 7680. *See* XVI.
 Kawanishi. Disinfecting. 6962. Mar. 20.
 Kelly. Apparatus for sterilising milk etc. 7422. Mar. 25.
 Lewis and Quain. Treatment of fluids with ozone. 7744. Mar. 27.
 Pattison (General Research Laboratories). Ozonising substances. 6738. Mar. 18.

Schindler. Converting vegetable substances of little or no nutritive value into food of high nutritive value. 7432. Mar. 25.

Sorensen. Manufacture of margarine. 6733. Mar. 18.

COMPLETE SPECIFICATIONS ACCEPTED.

5671 (1918). Greville. Treatment of flour. (124,298.) Apr. 2.
 5973 (1918). Bullo. Preservation of meat and other alimentary substances and apparatus therefor. (117,805.) Apr. 2.
 6404 (1918). Croft. Coffee preparation. (124,309.) Apr. 2.
 10,639 (1918). Austin. Separator and filter for purifying water for use in steam-generators and for manufacturing purposes. (124,130.) Mar. 26.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Ashcroft. Processes involving organic chemical reactions. 7120. Mar. 21.
 Blom. Process for manufacture of asymmetric ureas. 6639. Mar. 17. (Switzerland, 17.4.18.)
 Cremonese. Antimalaric serum. 6869. Mar. 19.
 Golding, Raschen, and United Alkali Co. Purification of calcium citrate and manufacture of citric acid. 6928. Mar. 20.
 Guinot and Job. Process for preparation of arsene derivatives. 6750. Mar. 18.

COMPLETE SPECIFICATIONS ACCEPTED.

14,085 (1915). Sldgwick and Lambert. Manufacture of di-ethyl and di-methyl ketones. Mar. 26.
 14,607 (1915). Fernbach and Strange. Manufacture of certain organic salts and acids. Mar. 26.
 4347 (1918). Abrahamsen. Tanno-casein compound and a process for the manufacture of the same. (114,158.) Mar. 26.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATION.

Boake, Roberts, and Co., and Lewis. Absorption of ultra-violet light. 6891. Mar. 19.

XXII.—EXPLOSIVES; MATCHES.

APPLICATION.

Gros et Bouchardy. Manufacture of picric acid. 7298. Mar. 24. (Switzerland, 23.3.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

14,367 (1915). Graesser and Titherley. Manufacture of picric acid. Mar. 26.
 14,655 and 14,656 (1915). Rintoul, Cross, and Nobel's Explosives Co. Explosives. Mar. 26.
 14,706 (1915). Rintoul, Beckett, and Nobel's Explosives Co. Explosives. Mar. 26.
 14,932 (1915). Perchlorate Explosives, and Harris. Manufacture of explosives. Mar. 26.
 16,607 (1915). Green. Manufacture of picric acid. Apr. 2.
 17,525 (1915) and 5551 (1916). McDonald. Manufacture of picric acid and apparatus employed therewith. Apr. 2.

I.—GENERAL; PLANT; MACHINERY.

PATENTS.

Drying and similarly treating materials; Apparatus for —. W. M. Brownell, London. Eng. Pat. 114,626, 2.4.18. (Appl. 5629/18.) Int. Conv., 6.4.17.

THE apparatus consists of a horizontal cylinder rotating on a central shaft and built up of a number of compartments separated by transverse foraminous partitions and having reversed spiral flanges supported by radial arms and provided with lifting buckets at intervals. The material enters the first compartment at the periphery and is carried to the centre; it then passes through an opening into the second compartment and is carried to the periphery, and so on to the last compartment from which it is discharged through a door which is normally closed, but is opened when in its lowest position by a cam and tappet. Drying is effected by heated air or gas which is passed horizontally through the cylinder in the opposite direction to that taken by the material.—W. H. C.

Drying granular, pulverulent, and pasty materials; Apparatus for —. H. Alexander, Leeds. Eng. Pat. 123,646, 18.4.18. (Appl. 6612/18.)

THE material is fed into a distributor mounted on a vertical shaft rotating in a cylindrical casing and is discharged on to a tray also mounted on the shaft. It is pushed round by stationary rakes and falls through slots in the tray to another tray below, which is fixed to the casing. Scrapers mounted on the rotating shaft carry the material round, and it drops on to a similar tray below and so on to the bottom. The openings in the trays are provided with inclined baffles which cause the air to pass in a spiral path through the apparatus and to come into intimate contact with all the material.—W. H. C.

Heat exchangers for use as feed water heaters, evaporators, condensers, coolers, and the like, but more particularly as heaters for use in oil fuel installations. H. A. Thompson and T. T. Brown, North Shields. Eng. Pat. 123,269, 15.2.18. (Appl. 2737/18.)

A NUMBER of heat-exchanging tubes are enclosed within a casing, to one end of which are secured inner and outer tube-plates. Each heat-exchanging tube is composed of an inner and outer tube arranged coaxially. The free ends of the inner tubes are preferably tapered. A rod is arranged axially within each inner tube, and a wire is wound helically upon the rod. A wire is similarly wrapped helically upon the inner tube. The inner tubes are secured to the outer tube-plates by expanding, and the outer tubes are similarly secured to the inner tube-plate. The outer tube plate is enclosed with a cover provided with inlet and outlet branches. The space between the outer tube-plate and cover is divided into chambers so that the fluid may be passed any desired number of times through the tubes. The outer casing is curved inwards from the tube-plate end so as to reduce the volume of heating fluid in the apparatus, and is surrounded by a lagging plate.—J. S. G. T.

Furnaces; Method of and apparatus for arresting sparks and economising fuel in —. W. A. Watterson, Euchareena, N.S.W. Eng. Pat. 123,575, 25.2.18. (Appl. 3340/18.)

A STEAM nozzle projects transversely into the discharge flue of the furnace and a jet of steam passes across the flue into the flared mouth of a pipe

opposite to the nozzle. Smoke, sparks, etc. are drawn into this pipe and after passing through a control valve and a mixing device, such as a fan or blower, are finally discharged into the ashpit for further passage through the fire. An auxiliary steam jet may be provided in the flue below the jet mentioned above, for checking flame and steadying the upward flow of hot gas. A damper is provided in the flue above the jets.—W. F. F.

Furnace. W. Crow and J. C. Schaffer, Tiffin, Ohio. U.S. Pat. 1,291,425, 14.1.19. Appl., 13.11.17.

A ROTARY kiln has its discharge end open, and of approximately the same diameter as the kiln. A furnace provided with a combustion chamber furnishes a supply of heating gas which flows into the kiln over the entire cross-section of the discharge end of the kiln. The furnace may be moved with respect to the kiln.—J. S. G. T.

Filter-press. British Dyes Ltd., J. Turner, and R. G. Parker, Huddersfield. Eng. Pat. 123,589, 27.2.18. (Appl. 3516/18.)

COMPRESSIBLE frames are used between the filter-plates in order that the filter-cakes formed in the ordinary way may have the bulk of the residual liquid squeezed out of them by hydraulic pressure which forces the plates together, compressing the frames. The latter are formed by hollow circular rings of copper or other suitable material which are open on their inner circumference and have beaded edges. The hollow part of the ring is filled with a hollow core of rubber or other elastic material to facilitate expansion when the hydraulic pressure is released.—W. H. C.

Purifying air; Apparatus for —. F. J. Talbot, Sheffield. Eng. Pat. 123,609, 9.3.18. (Appl. 4196/18.)

TWO fans are mounted on parallel shafts in a single casing. The fans are enclosed in permeable material, such as gauze, and dip into water in the lower part of the casing, which is provided with a division plate between the fans. The fans are rotated in opposite directions, and the air enters through two pipes, one for each fan, and is discharged through one pipe common to both. Channels are provided to collect the water from the casing and to return it to the interior of the fans.—W. H. C.

Extracting oils, fats, grease, wax, india-rubber, sulphur, and other substances soluble in organic solvents, from materials containing the same; Apparatus for —. L. J. Simon, J. W. Hinchley, and Fisher Chemical Engineering Co., Ltd., London. Eng. Pat. 123,645, 18.4.18. (Appl. 6597/18.)

THE extractor and the distilling vessel are formed in one piece, and the vapour from the latter passes up through two spaces, one on each side of the former, to the condenser. The extractor has a central top charging aperture closed by a cover and a lateral discharging door near the bottom. It is provided with upper and lower straining grids so that the extraction with heated solvent can be made either in an upward or downward direction. A sight and sampling gauge is provided so that the process of extraction can be watched, and a discharge receptacle for the extract is connected with the still by sealed pipes in such a manner that air cannot enter the latter. The extractor has a cover which can be lowered so as to seal it off and allow it to be emptied and recharged whilst the distilling chamber is working.—W. H. C.

Grinding-mills. H. W. Hardinge, New York. Eng. Pat. 123,705, 23.12.18. (Appl. 21,553/18.)

THE axial outlet of a rotary grinding drum is provided with a baffle which allows only the finer particles to be discharged, and deflects the coarser particles into external conduits which are arranged spirally with regard to the drum, and return the coarser material to the axial inlet at the opposite end of the drum.—W. H. C.

Tube-mills; Lining for —. A. V. Jensen, Devils Slide, Utah, Assignor to American Manganese Steel Co., Augusta, Me. U.S. Pat. 1,291,008, 14.1.19. Appl., 21.4.15.

THE lining plate on its inner side is undulatory in form, the section by a plane perpendicular to the axis of the tube mill being trochoidal. The undulations are different in successive longitudinal sections of the lining.—J. S. G. T.

Tube-mill. H. W. Weimer, Milwaukee, Wis., Assignor to Worthington Pump and Machinery Corp., New York. U.S. Pat. 1,291,311, 14.1.19. Appl., 25.3.18.

A TUBE-MILL is provided with a diaphragm divided into sections, which are hinged at their outer edges to the mill wall by means of lugs which enter recesses in the wall, and secured at the centre to a fixed hub by means of a bolt passing through the hub, and a clamping washer.—J. S. G. T.

Grading solid materials; Process of and apparatus for —. C. J. Reed, Philadelphia, Pa. U.S. Pat. 1,291,137, 14.1.19. Appl., 18.9.16.

THE material under treatment is fed into a grading vessel, the bottom of which is composed of a porous septum, uniformly resistant to the passage of fluid. A stream of fluid is caused to flow uniformly upwards through the porous septum at such a rate that horizontal stratification of the solid particles in layers of approximately uniform size results. The graded layers of particles are withdrawn by pipes immersed to suitable depths in the grading vessel, the motion of the particles in such pipes being initially upwards.—J. S. G. T.

Joint for fume pipes and absorption towers. W. Fletcher, Radcliffe, Lancs. Eng. Pat. 123,679, 26.6.18. (Appl. 10,504/18.)

Sorting material; Apparatus for —. J. Bernard and C. Vibert, Paris. Eng. Pat. 108,325, 28.7.17. (Appl. 10,862/17.) Int. Conv., 2.12.15.

SEE Fr. Pat. 480,376 of 1915; this J., 1917, 124.

Furnace. A. Smallwood, London. U.S. Pat. 1,290,583, 7.1.19. Appl., 18.4.16.

SEE Eng. Pat. 6323 of 1915; this J., 1916, 680.

Channel-furnace. E. E. Brand, Halsingborg, Sweden. U.S. Pat. 1,291,748, 21.1.19. Appl., 19.1.18.

SEE Eng. Pat. 119,366 of 1918; this J., 1918, 700 A.

Refrigeration; Process of and apparatus for —. F. W. Wolf, Assignor to The Isko Co., Chicago, Ill. U.S. Pat. 1,291,334, 14.1.19. Appl., 8.4.16.

SEE Eng. Pat. 110,533 of 1916; this J., 1917, 1228.

Heat-interchanging apparatus. E. L. Pease, Darlington. U.S. Pat. 1,291,632, 14.1.19. Appl., 1.3.17.

SEE Eng. Pat. 114,863 of 1917; this J., 1918, 289 A.

Calcining or treating granular material; Process for —. C. D. McCourt, London, Assignor to Surface Combustion, Inc., Wilmington, Del. U.S. Pat. 1,291,965, 21.1.19. Appl., 23.1.12. Renewed 6.5.18.

SEE Fr. Pat. 450,733 of 1912; this J., 1913, 587.

Spraying and atomising liquids; Apparatus for —. E. Slater, Greenfield. U.S. Pat. 1,292,898, 28.1.19. Appl., 22.6.18.

SEE Eng. Pat. 117,481 of 1917; this J., 1918, 497 A.

Washing or mixing liquids. Eng. Pat. 123,839. See III.

Extracting soluble substances. U.S. Pat. 1,282,407. See XII.

Matter in a finely-divided state. U.S. Pat. 1,259,708. See XIII.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Preparation of samples and elementary analysis of —. A. Zschimmer. J. Gasbeleucht., 1919, 62, 54–56.

THE air-dried coal is powdered and 50 to 100 grms. is sifted, and the amount of water determined before and after sifting. In the case of ordinary coal the loss of moisture in the process is trifling (e.g. 0.04 to 0.20%), but in the case of lignite and brown coal it may be sufficient (e.g. 0.62 and 0.88%) to cause appreciable errors in the subsequent analysis. The use of Deiglmayr's thermo-regulator (Ber., 1902, 1978) enables a combustion of coal to be made without attention. This apparatus consists essentially of a U-tube, filled with mercury, and is placed between the calcium chloride tube and the potash bulbs. One arm of the U-tube has a cross-piece at the top provided with a tap and connecting the absorption vessels; the other arm has an extension with a side tubulure connected with the gas supply for the burners below that portion of the combustion tube containing the sample of coal, whilst the gas outlet tube is attached to a tube which passes through a cork in the top of the extension to near the level of the mercury. The supply of gas to the burners is then automatically regulated by the pressure of the gas evolved from the sample of coal.—C. A. M.

Sulphur; Fusion bomb for determining — in coal. S. W. Parr. J. Ind. Eng. Chem., 1919, 11, 230–231.

A BOMB for determining sulphur in coal by fusion with sodium peroxide has a removable fusion cup provided with a cover, which is held in position by a screw cap. The charge of 0.5 gm. of coal with 9 to 10 grms. of sodium peroxide is thoroughly mixed by shaking the sealed cup, and is then ignited by heating the bottom of the cup with a Meker burner, or by means of a flame from a blast lamp. Combustion is complete within half a minute, and, after cooling the bomb under the tap, the cup is removed and placed in water. The apparatus is also applicable to the determination of sulphur in pyrites, rubber, etc., of carbonaceous matter in soils, and of halogens in organic compounds.—C. A. M.

Gas; Production of — from lignite. K. Bunte. J. Gasbeleucht., 1919, 62, 34–36.

THE results of gas-making tests with Hungarian "Totis" lignite carried out in 1909 are described. The air-dried lignite contained 10.58% moisture, 9.88% ash, and 79.54% of combustible matter with the following composition:—Carbon, 72.93; hydrogen, 5.98; oxygen, 16.27; nitrogen, 1.12; and sulphur, 3.70%. Each retort received a charge of 120 kilos., and the distillation was continued for 4 hours at 1200° to 1250° C. The yield of gas per 100 kilos. of lignite was 38.8 cb.m. at 1200° to 1220° C. and 40.0 cb.m. at 1220° to 1240° C., or, excluding carbon dioxide, 34.1 and 35.2 cb.m. respectively. After the usual cooling, washing, and purifying, the gas obtained at 1215° C. had the following composition:—CO₂, 12.6; C₂H₄, 4.0; CO, 14.1; H₂, 45.2; CH₄, 23.5; and N₂, 0.6%. After purification with soda-lime the yield per 100 kilos. of coal was 34.3 cb.m., with sp. gr. 0.460, gross calorific power 5950 cals., and illuminating power (150 litres per hr., slit burner) 11.8. After purification the gas still contained, per 100 cb.m., 220 grms. of sulphur in the form of carbon bisulphide and organic compounds. Even after further purification with lime the sulphur could not be reduced below 188 grms. per 100 cb.m., although wood charcoal reduced it to 40 grms. On this account the gas was unsuitable for use, but it is suggested that other kinds of lignite containing less sulphur might prove more satisfactory in this respect. The residue in the retort averaged 45.5 kilos. from 100 kilos. of lignite. It was a grey pulverulent mass which required forced draught for burning. The tar (average yield 4.64%) was fluid and had sp. gr. 1.19. On distillation 25.9% distilled between 170° and 270° C. and 15.6% above 270° C., whilst the yield of pitch was 58.5%. There was also obtained 14.7 kilos. of gas-liquor containing 1.18% ammonia, the total yield of ammonia being 228 grms. per 100 kilos. of lignite. Cyanogen (45 grms. HCN per 100 kilos.) was also separated. Preliminary drying would be necessary to render many kinds of lignite suitable for distillation.

—C. A. M.

Natural gas; Testing — for gasoline content. G. G. Oberfell, S. D. Shinkle, and S. B. Meserve. J. Ind. Eng. Chem., 1919, 11, 197–200.

SOLID material, such as charcoal, is used as an absorbent for gasoline vapours in natural gas, instead of oil as in the method previously described (this J., 1918, 231A). The charcoal is packed into the absorber, preferably of aluminium, consisting of four tubes, each 22 cm. long and internal diameter 2 cm. A removable perforated disc in each tube is kept in position about 3 cm. from the bottom by means of a hollow cylinder attached to it and resting upon a plate at the bottom of the tube. The tubes are connected in series by means of tubes attached to the bottom plate and the top plate of the absorber, and these plates are covered with rubber fittings to make the apparatus gas-tight and fixed down with thumb-screws. The gas is passed through a flow meter, then through a calcium chloride tube, a dry meter, and a manometer, before entering the absorption tubes, and finally, after leaving the tubes, through a second manometer. The sp. gr. of the gas may be approximately determined by measuring the time required for the delivery of a definite volume of air, with a constant differential height on the manometer of the flow meter, and applying the following formula:—

$$\text{Sp. gr. of gas} = \frac{(\text{Time for gas flow})^2}{(\text{Time for air flow})^2}$$

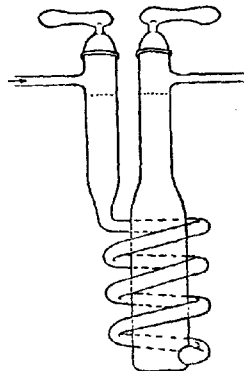
After the absorption the charcoal from the tube is mixed in a distilling flask with 600 c.c. of

"straw oil" (petroleum distillate of about 30° B., sp. gr. 0.875), and the gasoline distilled, preferably in the presence of glycerin. The results thus obtained are about 6% higher than those obtained with the portable oil absorber (*loc. cit.*).

—C. A. M.

Tar vapour in producer-gas; Determination of —. A. Zschimmer. J. Gasbeleucht., 1919, 62, 53–54.

THE author uses an apparatus based on the same principle as that of Gwiggner (Chem.-Zeit., 1912, 461), in which the gas after leaving the filter is chilled to separate tar oils. The filter-tube is packed with cotton-wool and asbestos, or for higher temperatures with glass wool and asbestos, and after being weighed is introduced into the gas tube. The outlet of the filter is connected with a cooling-tube (see diagram), which is suspended in ice-water, and which has plugs of cotton-wool in its inlet and outlet tubes. As a rule the gas is passed through the cooling-tube for about 12 hours, the filter-tube being changed every two hours. At the end of the given time the contents of the cooling-tube are transferred to a stoppered flask,



and the cooling-tube rinsed with freshly-distilled ether in the case of lignite gas or with benzene in the case of coal gas. The filter-tube is also washed out with the appropriate solvent, the solutions dehydrated by means of freshly-ignited sodium sulphate, filtered through cotton-wool and sodium sulphate, evaporated at as low a temperature as possible, and the residue dried and weighed. The filter-tube containing gas-black and ash is dried by means of a current of hot air, and weighed. It still contains particles of tar, which must be washed out with hot benzene or toluene when a separate determination of gas-black and ash is required. For a simultaneous determination of water vapour in the gas two calcium chloride tubes are inserted between the filter-tube and cooling-tube, and the whole apparatus weighed before and after the passage of the gas. The following results were obtained with typical samples of producer gas:—

Combustible	Water	Gas at 0° C. and 760 mm.	Tar and ash in filter	Tar oils in cooling tube	Increase in yield of tar by tar oils
	%	litres	grms.	grms.	%
Peat	16.5	196	7.754	0.639	8.24
"	33.3	303	6.948	1.423	20.4
Lignite	34.7	87	2.121	0.145	6.84
Brown coal	14.2	483	11.700	0.328	2.8
Brown coal briquette	51.7	649	7.000	2.603	37.1

—C. A. M.

Polythionate process of [gas purification]; Economic importance and scientific principles of Feld's —. A. Sander. J. Gasbeleucht., 1919, 62, 65–68.

THE author describes the reactions underlying Feld's process of removing hydrogen sulphide and ammonia from gases (this J., 1911, 1381; 1912, 430) and gives a brief account of the manner of using the method on the large scale. It is pointed out that in the German Empire in 1913, there were produced 32 million tons of coke and 14 million tons of gas containing about 140,000 tons of hydrogen sulphide, or 130,000 tons of sulphur, equivalent to 30% of the total import of pyrites. By means of the Feld process, sulphur could be recovered equivalent to 500,000 tons of sulphuric acid of 60° B. (sp. gr. 1.71) per annum.—S. S. A.

Motor fuels; Evaporation velocities and evaporation curves of —. K. Dieterich. Petroleum, 1917, 12, 676–677. Chem. Zentr., 1919, 90, II., 31.

THE author has determined the rate of evaporation of several motor fuels, including "normal," light, medium, and heavy benzine (petroleum spirit), motor benzol (90%), and motor alcohol (95%), and has plotted the results graphically. Good "normal benzine" gives a nearly straight, steeply falling, short curve. The higher the proportion of less volatile fractions present, the longer and more irregular the curve becomes, until it finally takes a nearly horizontal direction, as is shown in the curves for motor alcohol. The method of plotting the evaporation against the time is shown to be of great utility in the valuation of a motor fuel, a short, steep, straight curve indicating the best quality of fuel.—J. F. B.

Petrol; Determination of the calorific value and sulphur content of — by means of a bomb. A. Philip. Analyst, 1919, 44, 95–96.

THE petrol is weighed out in a small sealed glass bulb or, preferably, in a small stoppered bottle such as is sometimes used for vapour density determinations. This bottle is placed on the platinum tray of the bomb together with a weighed amount of pure naphthalene and the latter is ignited in the usual way. The heat liberated blows out the stopper of the bottle or breaks the bulb and ignites the petrol. The bomb used should be stronger than the ones usually employed and, as repeated use may produce "fatigue" in the metal, the determination should be carried out in an enclosure which will protect the observer from the results of an explosion.—W. P. S.

Petrol vapour; Physical properties of —. J. Rey. Comptes rend., 1919, 163, 509–513.

A MATHEMATICAL discussion of the laws governing the variation of pressure, volume, and temperature of petrol vapour and the velocity of flow of the vapour through an orifice.—W. G.

Naphthenic acids; Utilisation of the — present in certain mineral oil products. E. A. Kolbe. Seifensieder-Zeit., 1917, 44, 377–378. Chem. Zentr., 1919, 90, II., 31.

THE sodium salts of the naphthenic acids give a strong lather, but the penetrating and clinging odour is a disadvantage. To minimise this drawback the author recommends an addition of rosin soap (1:3), but even in that case, after washing the hands, the odour is perceptible after some time. The best result in suppressing the odour was obtained by the addition of 1–1.5 parts of fullers' earth to the mixed naphthenic and rosin soaps. The soap is suitable for the dilution of soap stock

or for the preparation of lubricants for drilling machines. Petroleum distillate from Boryslaw oil yielded 0.02% of naphthenic acids; gas oil yielded 0.1%.—J. F. B.

Tar from gas producers using lignite. Schulz and Kabelač. See III.

Ammonium salts from gas-liquor. Heineken. See VII.

Carbon monoxide in hydrogen. Rideal and Taylor. See VII.

Copper oxide in gas analysis. Ott. See XXIII.

PATENTS.

Briquette and method of manufacturing the same. C. E. Hite, Philadelphia, Pa., Assignor to American Briquet Co. U.S. Pat. 1,290,992, 14.1.19. Appl., 17.4.17.

AN emulsion for binding briquettes of coal or similar material is made by mixing starch 1 part and water 12 parts, and heating and stirring the mixture till the starch granules burst and form a paste. Two parts of the residue from petroleum distillation is then added and the mixture agitated to form an emulsion. The coal is mixed with 7.5% of the emulsion.—W. F. F.

Briquetting machines for lignite; Coal mixture for adjusting —. G. Neubert. Ger. Pat. 309,451, 7.9.16.

WHEN the moulds of a lignite briquetting machine have to be changed and a newly-ground mould has been put in position, the feed hopper is first charged with a suitable mixture of powdered coal and tar and the machine adjusted before charges of lignite alone are worked.—J. F. B.

Coke-ovens; Gas and air controlling means for —. F. Pelter, Assignor to A. G. McKee and Co., Cleveland, Ohio. U.S. Pat. 1,291,109, 14.1.19. Appl., 5.9.16.

THE gas supply and air supply to a by-product coke oven are separately controlled by means which produce a progressive throttling of both supplies.—W. F. F.

Vertical gas retorts; Arrangement and operation of —. Flrth, Blakeley, Sons & Co., Ltd., Dewsbury, and E. J. A. Shaw, Leeds. Eng. Pat. 123,408, 23.2.18. (Appl. 3240/18.)

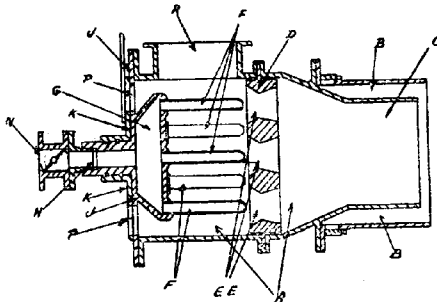
THE retorts are arranged in a circle or regular polygon and each is provided with a feed hopper which is charged from a radial shoot travelling on a circular track. The top and bottom lids of the retorts are actuated by shafts which work in unison so as to allow of the simultaneous charging and discharging of all the retorts.

Gas-generator. R. W. Polk, Assignor to Laclede-Christy Clay Products Co., St. Louis, Mo. U.S. Pat. 1,264,207, 30.4.18. Appl., 7.1.14.

TWO tiers of retorts are arranged side by side, with a common vertical standpipe between them connected to each retort. The portion of the standpipe between the tiers of retorts is composed of movable sections, so as to permit relative movement of the retorts due to expansion on heating. Liquid-seals are provided between the sections.—W. F. F.

Burners; Atmospheric — J. E. Weyman, Newcastle-on-Tyne. Eng. Pat. 123,434, 13.3.18. (Appl. 4416/18.)

Air is admitted through the valve, N, and pipe, H, to the chamber, G, and thence to the nozzles, F, which are concentric with the openings, E. Gas is supplied through the conduit, R, to the space, A, and air may also be admitted directly to this space through openings, P, in a plate, J, controlled by a disc, K. The valve, N, and disc, K, are con-



nected to a governor which is controlled by the pressure in the gas main. Secondary air is supplied to the space, B. The gas is drawn in and mixed with the air issuing from the nozzles, F, in proportion to the velocity and volume of the air, and the mixture passes out of the nozzle, C, at a high velocity. The burner allows of high efficiency being attained with gas of low calorific value, e.g., blast-furnace gas, at low pressures.—W. F. F.

Gas; Process for the combustion of — H. R. Maxon, Muncie, Ind. U.S. Pat. 1,291,589, 14.1.19. Appl., 16.3.18.

Gas and air are supplied to a mixer in the proportions necessary for complete combustion, and are passed to a burner at a velocity of flow which is just sufficient to prevent back-firing.—W. F. F.

Gas liquor; Method of and means for the treatment of — C. M. Croft, H. O. Carr, and U. O. S. Nairae, London. Eng. Pat. 123,337, 2.6.17. (Appl. 7956/17.)

The invention relates to a self-contained apparatus for producing ammonium sulphate from ammoniacal liquor, carried by a self-propelled vehicle, which may thus be used for dealing with the ammoniacal liquor produced at small works in different localities.—W. F. F.

Fuel for internal combustion engines. E. C. R. Marks, London. From P. d'O. Fayd'herbe, Mauritius. Eng. Pat. 123,450, 22.4.18. (Appl. 6772/18.)

The fuel consists of ethyl ether, 10–60%, a petroleum fraction of relatively high flash point, e.g., kerosene, 5–30%, and alcohol of not less than 36° Cartier (sp. gr. 0.84), 30–80%.—W. F. F.

Refining apparatus [for natural-gas gasoline]. W. O. Snelling, Pittsburg, Pa., Assignor to Consolidated Liquid Gas Co., Chicago, Ill. U.S. Pat. 1,259,679, 19.3.18. Appl., 21.2.13. Renewed 26.1.18.

The apparatus comprises a vaporiser and a series of superposed condenser sections with separating pieces between them. Gasoline is introduced through a central tube and is delivered through a spraying pipe so that it falls over a steam coil

arranged within the vaporiser. The valves of the apparatus are so adjusted that a pressure up to 900 lb. per sq. in. is developed by the vapours evolved from the gasoline. The unvaporised portion escapes through a pipe at the bottom. The vapours pass upwards through the condenser sections in succession and are subjected to fractional condensation, hot water being circulated through the coil in the lowermost condenser section, warm water through that in the middle section, and cold water through that in the top section.—L. A. C.

Hydrocarbons; Apparatus for cracking — J. W. Coast, jun., Tulsa, Okla., Assignor to The Process Co. U.S. Pat. 1,291,511, 14.1.19. Appl., 27.3.17.

Two horizontal cylindrical pressure stills, which are heated from below, are in free communication through a vessel serving as a trap, to retain carbonaceous matter separated during cracking and to equalise the internal pressures in the stills. An overflow pipe leads from the lower portion of one still to the trap, and a second overflow pipe leads from the upper portion of the trap to the second still.—T. St.

Lubricating oils; Manufacture of highly viscous — from oils of low viscosity such as "gas oil" etc. Zeller und Gmelin, Eislingen. Ger. Pat. 297,771, 28.4.15.

The mineral oil fraction serving as the raw material is chlorinated until its sp. gr. at 15° C. rises to 1.1–1.2. The chlorinated product is then dissolved in twice its weight of an organic solvent; treated with sulphuric acid of 66° B. (sp. gr. 1.84) and subsequently neutralised and washed. After the treatment with strong sulphuric acid, the oil may be further treated with fuming sulphuric acid containing about 20% SO₃.—J. F. B.

Feeding the furnaces of gas retort settings, coke ovens, mufles, and the like; Method of and means for — E. Masters, London, and Gibbons Bros., Ltd., Dudley. Eng. Pat. 123,617, 19.3.18. (Appl. 4805/18.)

Peat; Method of and means for removing water from — A. ten Bosch, The Hague. Eng. Pat. 123,517, 3.4.18. (Appl. 5692/18.) Int. Conv., 21.2.18.

SEE U.S. Pat. 1,290,494 of 1919; this J., 1919, 166 A.

Coke-furnace [oven]; Regenerating — E. Oré, Caen, France. U.S. Pat. 1,291,621, 14.1.19. Appl., 12.10.17.

SEE Eng. Pat. 118,470 of 1917; this J., 1918, 616 A.

Illuminating-gas; Furnace for production of — P. G. Strassmann, Crefeld-Linn, Germany. U.S. Pat. 1,285,833, 26.11.18. Appl., 12.12.16.

SEE Eng. Pat. 107,308 of 1916; this J., 1917, 957.

Hydrocarbon products; Extraction of — from shales and coals. D. T. Day, Washington, D.C., U.S.A. Eng. Pat. 123,415, 27.2.18. (Appl. 3521/18.)

SEE U.S. Pat. 1,244,840 of 1917; this J., 1918, 4 A.

Economising fuel in furnaces. Eng. Pat. 123,575. See I.

Gas-analysing apparatus. Eng. Pat. 120,921. See XXIII.

II.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Acetone. H. P. Bassett. Chem. and Met. Eng., 1919, 20, 190.

PREMY (Ann. Chim., 59, 7) referred to the production of acetone by the distillation of wood, sugar, gums, etc. with 8 parts of lime. Under proper conditions this large quantity of lime may be materially reduced, and if the mixture of lime and wood dust attains the maximum temperature in not less than 10 hours, and the distillation products are removed from the retort quickly by means of a current of inert gas, or preferably steam, a yield of 26% of acetone and mixed ketones may be obtained with 2½% of lime calculated on the weight of dry wood. The higher ketones are valuable where a retardation of evaporation of the solvent is required, as in aeroplane dopes. Sulphite-cellulose waste liquors can be utilised in this manner by evaporation to a thick consistency, and the addition of slaked lime, with subsequent drying and distillation.—C. A. K.

PATENTS.

Retorts or chambers for the destructive distillation of carbonaceous materials; Charging of —. J. West, Southport, and W. Wild, Blackpool. Eng. Pat. 123,441, 4.4.18. (Appl. 5788/18.)

Coal or the like is fed from a charging hopper into one end of a horizontal retort and pressed forward by a horizontal ram. The ram is made in two parts, one above the other, and the upper part is directly actuated by hydraulic means. The lower part is actuated by the upper part through a lost motion device so that both parts move forward together only when the acting faces of both parts are in line. The upper part of the ram reciprocates immediately below the hopper so as to control the mouth of the latter, and the material is moved forward by the upper part of the ram to fill the space between the lower part and the carbonised material already in the retort. The whole ram then moves forward to press the charge through the retort. An automatic catch is provided to prevent the lower part of the ram from moving forward before the two parts have their acting faces in line.—W. F. F.

Distillation of solid and liquid substances. A. B. Searle, Sheffield. Eng. Pat. 123,616, 18.3.18. (Appl. 4738/18.)

The continuous distillation of peat, coal, oil, etc. is effected by placing the material on a series of cars which are passed through a long tunnel oven heated externally or internally without the products of combustion coming into contact with the material being distilled. The tunnel is divided into a series of compartments so that the products of any desired stage of the distillation may be collected separately. The material on the cars may be compressed, if necessary, during the distillation. The contents of the tunnel may be treated with steam, flue gases, or with a portion of the distillation products in order to effect desired chemical changes or for the production of a neutral or other atmosphere in the oven. The heat contained in the residual products is used for warming the air required for the combustion of the fuel.—A. B. S.

Heating liquids by the heat generated by chemical reactions; Apparatus for —. H. Turrettini, Geneva, Switzerland. Eng. Pat. 117,601, 7.4.18. (Appl. 4041/18.) Int. Conv., 17.7.17.

At the bottom of a cylindrical chamber is a cage containing quicklime, baryta, or the like, above

which is a box containing acid, the bottom of the box being closed by a lead diaphragm. A fixed piston is placed between the lead diaphragm and the cage. The chamber is closed above by a cover provided with a screw plunger, whereby pressure may be exerted upon a lead cap in contact with the top of the acid-box, so as to displace the lead diaphragm, and discharge the acid on to the material within the cage. Escape of gases from the apparatus is ordinarily prevented by the lead cap, but should rupture of the lead cap occur, the gases can escape by way of notches in the plunger screw. The heater is inserted bodily in the liquid it is desired to heat.—J. S. G. T.

Lamp; Electric gas or vapour —. F. Skaupy, Assignor to Deutsche Gasglühlicht A.-G. (Auerger.), Berlin. U.S. Pat. 1,291,209, 14.1.19. Appl., 9.6.16.

The lamp consists of a receptacle containing a conducting substance which is made luminous by the current, and argon at such a high pressure that "the light column is contracted in cross-section and spaced away from the walls of the receptacle."

—T. St.

Incandescence electric lamps, particularly for high illuminating powers. Ver. Glühlampen und Elektrizitäts-A.-G., Ujpest, Hungary. Ger. Pat. 309,094, 15.3.17.

The electrodes of the lamp are not fused into the glass but are connected with the external leads by means of pole vessels containing a substance which excludes the air and is a conductor of electricity. Heavy incandescence bodies may be used in such lamps, which can be constructed to give an illumination of 100,000 candle power.—J. F. B.

Incandescence lamps and apparatus with glass bulbs exhausted of oxygen; Sealed-in wires for —. Schweiz. Glühlampenfabrik A.-G., Zug, Switzerland. Ger. Pat. 309,343, 10.2.18.

The wires are composed of a core of base metal surrounded by a composition made up of a mixture of glass or similar material with a difficultly fusible metal free from platinum. For instance, powdered metallic tungsten is made into a paste with water and intimately mixed with powdered glass; the wire is coated with the paste which is then heated to the fusion point, so that it forms a strongly adherent layer over the wire. Wires coated with this composition can be fused into glass in the same manner as platinum wires.

—J. F. B.

Vacuum [e.g., in X-ray tubes]; Method of producing and maintaining —. W. D. Coolidge, Schenectady, N.Y. Assignor to General Electric Co. U.S. Pat. 1,289,672, 31.12.18. Appl., 5.2.16.

See Eng. Pat. 104,230 of 1916; this J., 1917, 448.

III.—TAR AND TAR PRODUCTS.

Tar from gas producers using lignite as fuel. F. Schulz and V. Kabeláč. Mitt. Industrieförderungsinst. Handels- u. Gewerbekammer Prags, 1917. Chem. Zentr., 1919, 90, II., 28–30.

The tar from gas producers in which lignite is used as fuel somewhat resembles wood tar. In the determination of asphaltum by Holde's method (precipitation with alcohol from ethereal solution; this J., 1897, 471) only traces are obtained; "normal benzine" (Holde, this J., 1909, 831), however, precipitates nearly half the tar.

3—4 grms. of tar is digested with 40 times its weight of "normal benzine" at a gentle heat and filtered after 24 hours. The insoluble residue is then extracted successively with hot benzine and hot chloroform and the soluble extracts are determined. On prolonged extraction with light petroleum spirit or hot alcohol the tar is almost entirely dissolved. The tar from ordinary producers contains about 10% of water and that from Mond producers about 30%. In the laboratory the greater part of the water may be separated by allowing the tar to settle at about 90° C. The separated tar is then dehydrated at about 140° C.; calcium chloride is unsuitable for drying the tar and tar oils, owing to the presence of phenols. In the distillation of the tar the first oil comes over at 215°—225° C.; the distillate is colourless at first but later turns brown. Distillation proceeds normally up to 290° C.; cracking then begins and oils containing paraffins distil from 300° to 340° C., leaving 20% of coke residue; during cracking the temperature of the boiling pitch rises to 400° C. The distillation of the tar yields about 30% of first running oil, boiling up to about 290° C. and free from paraffins, and about 50% of cracked oil containing paraffins. The first running oil contains organic acids, phenols, nitrogenous bases, unsaturated aromatic and saturated hydrocarbons. The phenols are partly soluble in water; on shaking the oil with dilute caustic soda in the absence of air, a yellow solution is obtained which immediately turns red in the air and finally black. After extracting the phenols with 5% caustic soda a further extraction is obtained by shaking with 20—25% lye; the extract absorbs oxygen but does not turn red. After removing phenols and bases the oil is still liable to turn black or brown and reacts strongly with concentrated sulphuric acid. It may however be refined with an acid containing less than 80% sulphuric acid. After refining and distilling, the oil does not change its colour and the unsaturated hydrocarbons may be precipitated by diluting the waste acid. The phenols are highly oxidisable and deposit a black resinous mass from which the simple phenols may be distilled with steam. Treatment of the oil with petroleum spirit in the presence of a little water precipitates a heavy oil which contains the greater part of the phenols; this is due to the formation of a phenol hydrate. Treatment with a small quantity of 75% sulphuric acid also precipitates a heavy oil very rich in phenols, but these separations are not complete.

—J. F. B.

Anthracene, carbazole, and phenanthrene; Solubilities, separation, and purification of —. [Determination of carbazole.] J. M. Clark. J. Ind. Eng. Chem., 1919, 11, 204—209.

For the recovery of anthracene, carbazole, and phenanthrene from "anthracene oil," the solids are separated by cooling, the creosote oil drained off, and the residual crystals centrifuged or pressed. A typical sample contained 30.1% of anthracene, 22.0% of carbazole, and 47.9% of phenanthrene. For the separation of these compounds 10,000 grms. of the mixture was slowly heated to 80° C. with 15,000 grms. of crude coal-tar naphtha, cooled to 30° C., and filtered. The insoluble portion (A) consisted of 4125 grms. of a mixture of 60.2% of anthracene, 35.1% of carbazole, and 4.7% of phenanthrene, whilst the soluble portion (B), after distillation of the naphtha, consisted of 5760 grms. of a mixture of 8.4% of anthracene, 11.1% of carbazole, and 80.5% of phenanthrene. The insoluble portion (A) was slowly heated to 80° C. with 10,000 grms. of light pyridine, cooled, and filtered at 15° C., leaving an insoluble portion (C) consisting of anthracene 85.2%, carbazole 13.6%, and phenanthrene 1.2%;

and a soluble portion (D) consisting of 16.4% of anthracene, 72.2% of carbazole, and 11.4% of phenanthrene. The insoluble portion, C, was purified by further treatment with pyridine, sublimation, distillation after fusion with potassium and sodium hydroxides, and crystallisation from benzene, yielding a product (645 grms.) containing 99.91% of anthracene, 0.06% of carbazole, and 0.03% of phenanthrene. The soluble portion, D, was treated with naphtha as before, and yielded 1241 grms. of insoluble solids containing 81.5% of carbazole. This was purified by treatment with 98% sulphuric acid, and addition of water, which dissolved the sulphonated anthracene, and on subliming the insoluble portion 960 grms. of 99.5% carbazole was obtained. The soluble portion, B, containing the bulk of the phenanthrene was again treated with naphtha and fractionated into an insoluble portion (825 grms.) containing 2.8% of phenanthrene, and a soluble portion (4872 grms.) containing 93.8% of phenanthrene. By fusion with alkali hydroxides, distillation, further treatment with naphtha, decolorisation with bone-black, and treatment with alcohol, 2490 grms. of pure crystallised phenanthrene was obtained. It was found that in the fusion with alkalis for the removal of carbazole the best results were obtained with a mixture of sodium and potassium hydroxides. For the purification of carbazole from anthracene by means of sulphuric acid a large excess of acid is required. In practice it does not pay to work up the "green salts" for anthracene unless they contain at least 15% thereof. For the determination of the carbazole the following modification of the Kjeldahl method is rapid and gives results in agreement with the Du Pont nitrometer method: A mixture of 0.5 gm. of the material with 30 c.c. of strong sulphuric acid and 0.7 gm. of mercuric oxide is digested for one hour over a low flame, then cooled, and, after the addition of 10 grms. of potassium bisulphate, boiled until clear. The liquid is cooled to 35° C., and diluted with 200 c.c. of water, 10 grms. of sodium thiosulphate added, and the whole made strongly alkaline and distilled.—C. A. M.

Nitro-groups; Estimation of — in organic compounds by means of stannous chloride. J. G. F. Druce. Chem. News, 1919, 418, 133.

The following modification of Young and Swain's method (J. Amer. Chem. Soc., 1897, 19, 812) is found to give good results with nitrobenzene, *o*-nitrotoluene, *m*- and *p*-nitroanilines, *m*-dinitrobenzene, and *p*-nitrophenol (compare also Altmann, this J., 1901, 622): A weighed quantity (about 0.2—0.6 gm.) of the nitro-compound is placed in a 200 c.c. Erlenmeyer flask and about 30 c.c. of alcohol is added. A slow stream of carbon dioxide is passed through the flask while the latter is warmed on a water-bath. When the air of the flask is displaced by carbon dioxide, 50 c.c. of standard stannous chloride solution is introduced and the mixture warmed for 2 hours on the water-bath, the gas current being continued meanwhile. The flask is then allowed to cool and its contents titrated with *N*/10 iodine in presence of starch. The stannous chloride solution is prepared by dissolving 25 grms. of tin in 250 c.c. of concentrated hydrochloric acid and making up to 1000 c.c.; it is standardised against the iodine solution immediately before use, as it undergoes gradual oxidation.—T. H. P.

PATENTS.

Tar stills. J. Archer, Stockton-on-Tees. Eng. Pat. 123,880, 19.4.18. (Appl. 6667/18.)

In an apparatus for dealing with tar containing up to 40% of water, the tar is blown by steam pres-

sure from a steam-heated tar egg to an overhead tank heated by steam coils, from which it flows through a heat-interchanger to the still, which is shallower than the usual type and is provided with partitions so that the tar takes a zig-zag course through narrow channels. The depth of the tar in the still is 4 to 6 inches. Fins equal in depth to the tar layer are arranged between the partitions on the inside of the bottom of the still to assist in the transmission of heat. Heat is supplied to the still by passing the products of combustion from gas burners through a zig-zag flue arranged below the still. The distillate is collected in a closed pot in which the oil and water are separated, and the waste gases are burned under the still. The residual pitch, on leaving the still, flows through the heat interchanger in the opposite direction to the tar.—S. S. A.

Benzol and other oils; Means of and apparatus for purifying — and washing or mixing two liquids of different specific gravity. M. W. Blyth and T. V. Miles, Sheffield. Eng. Pat. 123,839, 11.3.18. (Appl. 4237/18.)

BENZOL or other oil is fed into a tank provided with two valves, through one of which a regulated flow of benzol is admitted to a convoluted pipe, whilst the other valve admits a controlled quantity of benzol to the upper part of a tank containing sulphuric acid, thereby displacing the acid from the bottom of the tank through a siphon to the convoluted pipe where it mixes with the benzol. The benzol is purified by the acid as it passes down the pipe to a tall separating vessel from the bottom of which the spent acid is drawn off, the benzol flowing from an opening near the top through a pipe which enters a second tall cylinder midway between the top and the bottom. In this vessel the benzol is treated with caustic soda lye which is introduced at about the same level as the benzol, through a pipe entering the cylinder at the top. The caustic soda lye is drawn off by a siphon from the bottom of the cylinder, whilst the benzol flows from the top of the cylinder to other similar vessels in which it is washed with water in the same manner. The working of the apparatus is continuous.—S. S. A.

Creosote oil; Separating and purifying —. W. Crabb, West Hartlepool. Eng. Pat. 123,857, 22.3.18. (Appl. 5080/18.)

CRUDE creosote oil and sulphuric acid (1:3 by weight) are delivered in the proportion of 1 of acid to 100 of the oil, to the same part of the upper end of a lead-lined, sloping, horseshoe-shaped trough, provided with lead baffle-plates. The oil and acid mix intimately in the trough and flow from its lower end into a settling tank which is subdivided longitudinally by partitions having top and bottom holes at alternate ends, so that, in filling the tank the mixture enters at one end and follows a tortuous course. Arrangements are made for drawing off the creosote oil and the acid layer from taps fixed at suitable levels.—S. S. A.

Para-nitrotoluene-ortho-sulphonic acid; Manufacture of —. S. V. Hintikka, Helsinki, Finland. Eng. Pat. 123,548, 17.1.18. (Appl. 1004/18.)

TWENTY kilos. of *p*-cymene is sulphonated by slowly stirring with 60–80 kilos. of sulphuric acid (66° B., sp. gr. 1.84) at about 60° C. The product, consisting chiefly of cymene- α -sulphonic acid, is added to a slowly-stirred mixture of 18 kilos. of nitric acid (sp. gr. 1.45) and 20 kilos. of concentrated sulphuric acid, keeping the temperature at 40°–60° C. Instead of nitric acid, corresponding

quantities of sodium or potassium nitrate may be mixed with the sulphuric acid, in which case the temperature is maintained at 60°–70° C.—L. A. C.

Naphthol and allied products; Manufacture of —. R. N. Wallach, Wappingers Falls, N.Y. U.S. Pat. 1,291,300, 14.1.19. Appl., 12.1.18.

A CONCENTRATED aqueous solution of a salt of a naphthalenesulphonic acid at about 100° C. is gradually fed into a covered vessel containing fused aqueous caustic alkali at about 300° C.—L. A. C.

IV.—COLOURING MATTERS AND DYES.

Indigo industry; Present position and future prospects of the natural —. IV.—Effect of superphosphate manuring on the yield and quality of the indigo plant. W. A. Davis. Agric. J. India, 1919, 14, 21–41.

FROM the results of manurial trials made by various planters it is shown that manuring with superphosphate not only very greatly increases the yield of green plant per acre, but also gives a plant of very superior quality, on the Bihar indigo soils which have recently shown such serious signs of impoverishment. When the soil conditions are favourable, and these can be assured by proper manuring, enormous yields of indigo can be obtained even in a year of unfavourable climatic conditions and with the existing Java plant. A combination of green manuring with "sannai" and superphosphate is apparently an ideal one to ensure not only a high yield of plant but also high quality.—W. G.

Sulphur dyestuffs; Structure of highly sulphurised —. W. Zänker. Z. angew. Chem., 1919, 32, 49–53.

WHEN highly sulphurised sulphur dyestuffs are treated by the method previously described (this J., 1918, 685A) for the conversion of the labile sulphur into sulphuric acid, the residual purified dyestuff yields a further quantity of sulphuric acid if again heated strongly in the air. This oxidation may be brought to completion by the following procedure, which results not only in the transformation of the labile sulphur into sulphuric acid but also in the coagulation of the whole of the adsorbed sulphur. From 30 to 50 grms. of the commercial dyestuff, either alone or with addition of the quantity of pure sodium sulphide just necessary, is dissolved in water and the solution filtered hot, the cooled filtrate being made up to about 3 litres and rendered faintly acid with acetic acid. After deposition of the dyestuff the liquid is decanted off, neither acetic acid nor neutral salts being detectable as a rule after six such decantations. Any difficulty in the deposition and decantation usually disappears if the water added each time is made just acid with acetic acid; the trace of adherent acetic acid is eliminated during the subsequent drying, but the sulphuric acid formed during drying should not then be determined by titration. The dyestuff is filtered off, dried at 100° C., and rubbed in a mortar with such a quantity of *N*/10 sodium hydroxide that the mass does not turn blue litmus paper (writing paper best) red. The drying and mixing with alkali solution are repeated until no further formation of acid is detectable. With dyestuffs yielding much sulphuric acid, a larger proportion of the sodium hydroxide solution may be added at first and the drying may be effected at a higher temperature, but 120°–130° C. should not be exceeded. With careful working the

sulphuric acid formed may be calculated from the volume of standard alkali added, but determination by titration in presence of phenolphthalein (*loc. cit.*) is preferable. When heated with sodium hydroxide solution, certain dyestuffs tend to form sodium salts, which do not yield their sulphur readily to solvents. After the above treatment the dyestuff is, therefore, moistened with very dilute acetic acid, freed from any excess of the latter, and dried. After removal of organic impurities by extraction with alcohol, the residue is extracted for 5–10 days in a Soxhlet apparatus with acetone or carbon bisulphide; this dissolves all the free sulphur, which has been brought by the treatment described into a much less highly disperse condition. The sulphur thus extracted amounts to 0.8–3%. The material may be subsequently freed from acetone or carbon bisulphide by a short extraction with alcohol or light petroleum, inorganic salts being then eliminated from the dried dyestuff by repeated lixiviation with water; in some cases the latter purification is impossible as the dyestuff itself dissolves in water. The dyestuffs ultimately obtained readily form voluminous precipitates, which assume a highly gelatinised condition, the water-content and capacity for swelling often exceeding those of gelatin. When dried, these jellies form hard, brittle masses, which behave as reversible colloids, rapidly gelatinising with water, especially in presence of a few drops of sodium hydroxide solution; repetition of this treatment destroys the power to gelatinise. The different extracted dyestuffs differ greatly in properties but they are all insoluble in ordinary organic solvents, and in sodium sulphide or alkali hydrosulphite solution they mostly dissolve more readily than the original products; the solutions have markedly inferior dyeing properties.—T. H. P.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

[Wool] scouring process; Some problems relating to the —. S. A. Shorter. *J. Soc. Dyers and Col.*, 1919, 35, 55–58.

Soap acts as a detergent in two ways: by lowering the interfacial tension between water and grease and by stabilising fine emulsions and suspensions. The first effect may be studied by determinations of the "drop number" of soap solutions in mineral oil. Experiments showed that the influence of the concentration on the drop number increased at an extremely rapid rate up to 0.4% soap concentration, after which a further increase in concentration had but little effect. Thus it is not economical to employ stronger soap solutions. Experiments on the effect of soap on the stability of fine suspensions showed that there is a maximum effect at a concentration of 0.2–0.3%. The action of alkali in the soap is to increase the surface tension effect, even against mineral oils; the alkali also tends, if its concentration exceeds a certain small amount, to diminish the stabilising effect. In practice it is usually advisable to sacrifice to some extent the stabilising effect for the sake of obtaining a rapid initial emulsification. When piece goods are scoured with alkali alone the emulsification is due to the formation of soap on the surface layers by the action of the alkali on free fatty acid in the oil. For this purpose weak alkaline solutions are of no use, since they have no stabilising power. The alkali must be strong enough to form a sufficiently strong soap solution and there must be sufficient free fatty acid present in the oil. On the

other hand, if the alkali be too strong, a soap solution cannot be formed owing to the coagulation of the emulsion droplets. The addition of soap tends to diminish this coagulating effect. When scouring with alkali alone, the oil should contain 30% of free fatty acid and it is better to avoid high concentrations of alkali in the initial stages until sufficient soap has been formed and dissolved to produce the requisite stabilising effect; better results should therefore be obtained by adding the alkali gradually. The emulsion produced with alkali alone is coarser than when soap is used. In some cases the detergent action is deliberately sacrificed in order to avoid the "bleeding out" of the colours, the strong alkali tending to salt out not only the soap but also the dyestuff. The exhaustion of the soap bath may be partly due to the removal of soap as a surface layer on the fine droplets of the emulsion, but the principal cause is fouling of the bath by dirt and grease.—J. F. B.

Raffia and cutocelluloses—composition and constitution. C. F. Cross and E. J. Bevan. *J. Soc. Dyers and Col.*, 1919, 35, 70–75.

RAFFIA is a complex tissue composed of a true epidermis or cuticle and underlying sclerenchyma, the cells of which are sufficiently elongated to rank as fibres; under most chemical treatments the two tissues exhibit a joint resistance. The material showed: moisture 8–9%; ash 2.7%; on boiling with 1% caustic soda solution the loss was 16.8% in 5 minutes and 24.3% in 60 minutes. The attack by aqueous caustic soda was not, however, sufficiently specific to afford a pure preparation of cellulose by the chlorination method. On the other hand, a preliminary treatment with alcoholic caustic soda broke down the resistance of the cutocellulose ester and subsequent chlorination yielded 42% of cellulose. The loss of weight with alcoholic soda was considerable: 39.04% with 2% NaOH and 46.7% with 5% NaOH. The residue after saponification was readily chlorinated, the lignone groups of the sclerenchyma fibres being attacked and the ultimate fibres, 2 mm. in length, being separated. The ratio of HCl formed to chlorine combined with the lignone was approximately 2:1. The isolated cellulose yielded 5.2% of furfural, as compared with 8% for the crude raffia. From the soaps of the alkaline hydrolysis, 11–12% of a fatty acid and 6–7% of a resin acid, the sodium salts of which are insoluble in alcohol, were separated. The fatty acid had a composition corresponding to the formula $C_{17}H_{32}O_2$, with one COOH and one OH group; iodine value (Wijs), 13.6%. The resin acid contained 58.4% of carbon and 10.0% of hydrogen. On fusion with aqueous sodium hydroxide at 250°–300° C. the separation of the fat constituent occurred with less modification, its lower acid value being held to indicate a higher molecular weight; the cellulose on the other hand was profoundly decomposed with formation of volatile acids. Conversion into viscose, benzylation and acetylation of the raffia gave mixed reactions of no sharply differentiated character. Nitration gave results indicating profound oxidation of the fat and resin components. The lignin reactions of raffia are considerably suppressed; it does not combine with phloroglucinol and reduces permanganate only to a limited extent. Certain effects of nitric acid are specific: a mixture of 36 parts of glacial acetic acid and 2 parts of nitric acid to 5 of raffia at 95° C. gave the fat-resin complex in solution in a form showing minimum modification. Dilute aqueous nitric acid produced a structural cleavage between the cuticle proper (40%) and the sclerenchymatous tissue (60%). The cuticle proper closely resembles that of apple peel. The general characteristic of raffia is that of an ester of fatty and resin acids

with an oxidised modification of cellulose in intimate association with a lignocellulose ether. A purple reaction with ferric chloride, which is intensified by alkaline saponification, appears to be a characteristic of the complex tissue.—J. F. B.

Sal bark (Shorea robusta) and some physiological problems. C. F. Cross and E. J. Bevan. J. Soc. Dyers and Col., 1919, 35, 68–70.

SAL bark is the product of an Indian tree and its extracts are largely employed for tanning. The original bark contains 10.5–12.6% of tannin, 10.2–10.8% of non-tannin extractive matter, and 8.5–9.8% of ash. The exhausted tan bark has been investigated from the point of view of a raw material for paper making. It yields 45% of cellulose by the chlorination method and the ultimate fibre has a length of 1.0–1.5 mm., but the material is not adapted for the industrial manufacture of bleached cellulose, although it may be converted into a brown pulp, suitable for wrapping papers and boards, with a yield of 40–42%. A peculiarity of this bark is the high proportion of ash, which is largely due to the presence of calcium oxalate. The exhausted bark contains 12–16% of oxalate, calculated as CaC_2O_4 , existing largely, however, in the form of the binoxalate. This oxalate is not readily extracted in the cold, and for its recovery by an industrial process, it is necessary to steep the material in a solution containing 15% HCl. The extraction of the oxalic acid could be operated in conjunction with the manufacture of paper pulp. The authors discuss the possible hypotheses which would account physiologically for the production and accumulation of oxalic acid in the cortical tissues.—J. F. B.

Waxed paper; Recovery of paraffin wax from waste — by extraction with volatile solvents. O. Kress and L. F. Hawley. J. Ind. Eng. Chem., 1919, 11, 227–229.

By shredding waste waxed paper and treating it with free steam in a beater for 2 days the amount of paraffin wax in the pulp was reduced to 0.9%, but the pulp was not suitable for regular use in an ordinary paper machine. Better results were obtained by extracting the wax with gasoline (b.pt. 90° to 140° C.) in a vertical cylindrical extractor provided with a closed steam coil and a steam jet. After the extraction with the boiling solvent, steam was admitted, the solution drained off from the bottom, and the extraction continued with fresh solvent. By using 8 galls. of solvent to 20 lb. of paper in a series of 4 extractions, according to the counter-current principle, from 97.0 to 97.5% of the wax was extracted. Paper made from the recovered pulp was as strong as the original paper, and, after bleaching, could be used again for the manufacture of waxed paper.—C. A. M.

Acetone. Bassett. See IIB.

PATENTS.

Viscose; Process for the precipitation of — for the production of artificial threads and other structures. G. Walther, Crefeld, Germany. U.S. Pat. 1,292,544, 28.1.19. Appl., 9.6.14.

See Fr. Pat. 473,256 of 1914; this J., 1915, 546.

Material resembling celluloid from fish scales. U.S. Pat. 1,264,979. See XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Titanium compounds; Properties and uses of some — [in dyeing etc.]. J. Barnes. J. Soc. Dyers and Col., 1919, 35, 59–62.

TITANIUM salts are employed as mordants for alizarin dyestuffs, logwood, etc., as a constituent of a red colouring matter in combination with tannin, and as stripping agents for dyestuffs and reducing agents in analysis. The most important commercial salt is titanium sodium sulphate $\text{TiO}(\text{SO}_4\text{Na})_2 \cdot 2\text{H}_2\text{O}$. It is very difficult to dissolve in pure water and is at once decomposed by boiling water, giving insoluble metatitanic acid. By adding a certain amount of sulphuric or oxalic acid it may readily be dissolved by heating. A strong solution may be prepared by frequent stirring with 2–3 parts of cold water for several days. This solution may be diluted to a certain point without decomposition or it may be neutralised and rendered basic by the addition of alkali, provided it be kept cold and concentrated; by moderate dilution of the basic solution the titanium is precipitated as hydroxide; on heating the precipitate is converted into metatitanic acid which is useless from a tinctorial point of view. After addition of a certain amount of sulphuric acid to a highly diluted solution of the sulphate, the latter may be heated to 40° C. without serious change. By stirring 1 part of the salt with 9 parts of a cold solution of Glauber's salt at 5° Tw. (sp. gr. 1.025) for several days a solution containing 2% of TiO_2 may be obtained which is stable in the cold and may be diluted almost indefinitely with weak sodium sulphate; such a solution is useful for fixing tannin in mordanted goods. Titanium potassium oxalate, $\text{TiO}(\text{C}_2\text{O}_4\text{K})_2 \cdot 2\text{H}_2\text{O}$, is now replaced by the cheaper sodium salt. In using these salts for leather dyeing it is important to add sufficient oxalic acid to combine with the whole of the calcium in the water. The ammonium salt is more soluble than the potassium salt and is not so readily obtained free from iron; with the addition of sodium acetate it may be dried on cotton without tendering. Titanium tanno-oxalate is simply a solution of titanium tannate in oxalic acid. Titanous salts may also be used as mordants by steeping the cloth in a solution of the chloride or sulphate, squeezing and exposing to the air; a considerable deposit of TiO_2 in the fibre is thus produced and may be increased by preparing the cloth with Turkey-red oil or tin. With titanous solutions, any iron present has no deleterious effect. Titanium browns are more resistant to light than the sulphur colours. Any shade of brown may be obtained on tanned yarn by combining iron with the titanium sulphate liquor and varying the shade by adjusting the acidity of the bath, the iron tannate being more sensitive to acids than the titanium.—J. F. B.

PATENT.

Textile fabrics; Stop motion for machines for treating — with liquids. F. Wood and T. France, Huddersfield. Eng. Pat. 123,626, 20.3.18. (Appl. 5259/18.)

THE invention relates to mechanism whereby the operation of the machine is stopped automatically in the event of the drafts of fabric or any of them failing to pass through the respective openings in the guide rail, or the draft of fabric winding around one of the nipping rollers, or the breakage or failure of the belt which transmits motion to the draw roller.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Sulphuric acid; Manufacture of — from galena. Goldmann. Metall u. Erz, 1919, 16, 41—48.

A CONTACT plant for the manufacture of sulphuric acid from galena has been in operation at the Binsfeldhammer lead smelter, Stolberg, since January 1912. The ore mixed with about 20% of limestone is subjected to preliminary sintering in a cylindrical coke-fired furnace the sole of which has a diameter of 6–8 m., and revolves at a speed of 20 revolutions per hour. The mixture, which contains 11% of sulphur, thus loses 10% of its sulphur content; the furnace gas contains 0.15–0.20% of sulphur dioxide. The moistened material is then blast-roasted in an automatic Dwight-Lloyd-von Schlippenbach sintering pot containing 24 compartments, 16 of which communicate with a fan; the other eight are used for cooling and re-charging. The fuel consumption is $\frac{1}{2}$ – $\frac{3}{4}$ %. The richest gas from the first 8 compartments contains 4–5% of sulphur dioxide; the poorer gases from the last 8 compartments are led into the first compartments. The total cost of roasting is M. 3.12–3.50 per metric ton. The most difficult problem, elimination of the fume from the gas current, was eventually solved by the use of filters containing sawdust resting on wood shavings, which becomes impregnated with lead fume and is renewed from time to time. The platinum contact mass has been in use for 3 years without regeneration.—W. R. S.

Nitric acid; Concentration of —. M. Kaltenbach. Chim. et Ind., 1919, 2, 142–152.

PRELIMINARY concentration of nitric acid to 65–68% is effected by heating with gases obtained by the combustion of solid or liquid fuel. The plant consists of a series of closed earthenware pans, arranged in cascade and connected by tubes. The acid and hot gases flow in counter-current. The series of pans is divided into two distinct parts. In the first part the acid is heated to the boiling point, whilst the second part forms the concentrator proper. The vapours pass to a tower divided into two sections. In the lower portion the vapours from the pans meet weak nitric acid which is thereby concentrated on its way to the pans. In the top portion of the tower the last traces of nitric acid are absorbed by a spray of cold water. The vapours issuing from the top of the tower pass to an ejector-condenser of the barometric column type which maintains the apparatus under diminished pressure. The weak acid recovered in the top portion of the tower may be used in washing towers for the recovery of nitrous vapours. For further concentration of the acid, distillation in admixture with a dehydrating agent, such as sulphuric acid, is necessary. A plant is described in which the sulphuric acid is introduced at the top of a tower of volvic stone, granite, or acid-proof metal, where it meets with the weak nitric acid. The nitric acid is vaporised at the bottom of the tower by steam. After contact with the sulphuric acid, the dehydrated nitric acid emerging from the top of the tower is conveyed to condensers. The resistance of the system is overcome by a vacuum pump. The efficiency of the process is best controlled by compiling a heat balance sheet. The author indicates in detail the factors affecting the balance and a table is given which combines the results of several trials. It is shown that the proportion of steam required, relative to the amount of water evaporated, rises as the nitric acid becomes more concentrated. The production of a tower is relatively lower as the concentration is increased. By superheating the steam to 450° C. and preheating the sulphuric acid to

90° C. there is an increase of 11.5% in the production of a tower treating 45% acid, whilst the amount of sulphuric acid required is reduced by 18% and the quantity of steam injected by 38.5%. The concentration of the two acids and the rate of their delivery to the tower require careful control.

—S. S. A.

Hydrocyanic acid; Manufacture of —. H. A. Pelton and M. W. Schwarz. Chem. and Met. Eng., 1919, 20, 165–166.

HYDROCYANIC acid is produced by the interaction of sodium cyanide and dilute sulphuric acid, an excess of acid being used to prevent the formation of dark tars. Sodium cyanide solution (30%) is slowly run into dilute sulphuric acid contained in a 50-gallon steam-jacketed lead-lined vessel, provided with a mechanical stirrer, and the hydrocyanic acid evolved, together with steam, passes through a column packed with coke into a reflux condenser consisting of a coil of 1 in. diam. iron piping surrounded by ice. Condensed liquor runs back into the still and the cooled gas is passed through a much larger ice-cooled condensing worm, from which the liquefied hydrocyanic acid runs into a sheet iron cylinder surrounded by ice. The receiving cylinder is provided with a bottom outlet pipe and a vent pipe at the top. Towards the end of the reaction, the charge in the still is heated to boiling by means of steam to expel the last traces of hydrocyanic acid. The contents are run out from a bottom discharge while hot to avoid trouble from crystallisation. An average yield of 78% of the theoretical quantity has been obtained, the acid having a purity of 90–95%, and a production of 250 lb. per 24 hours was maintained in a plant of this capacity. Provision is made for brine cooling and more accurate temperature control in an enlarged plant, and a bisulphate tower is introduced between the main condenser and the receiver to obtain more efficient dehydration, as the stability of the acid is dependent upon its purity.—C. A. K.

Ammonium salts; Simple apparatus for obtaining — from the gas liquor in small gas-works. M. Heineken. J. Gasbeleucht., 1919, 62, 30–31.

THE gas liquor flows from a high-level lead-lined wood reservoir about 1 cb.m. in capacity, through a coke or charcoal filter into a tank, where it is nearly neutralised with waste hydrochloric acid or sodium bisulphate, and is then run into evaporating pans at a lower level. These are heated by means of a water- or sand-bath, the coke from the filter being utilised for heating the bath. About 175 kilos. of sodium bisulphate is required to neutralise 1 cb.m. of gas liquor containing 2.5% of ammonia. The resulting salt contains 9 to 15% of nitrogen.

—C. A. M.

Lead; Determination of — in lead salts. R. L. Morris. Chem. and Drug., 1919, 91, 242–243.

INVESTIGATION of the B.P. method for the determination of lead in pure lead salts (precipitation as oxalate and titration of the precipitate with permanganate solution) showed that low results are obtained unless the precipitation is made in relatively concentrated acetic acid solution. The following procedure is recommended:—0.5 gm. of lead acetate is dissolved in 50 c.c. of 50% acetic acid, the solution heated to boiling, and 1 gm. of oxalic acid is added; when cold, the precipitate is collected on an asbestos filter, washed with water to remove all free oxalic acid, then transferred to a vessel containing 150 c.c. of hot 6% sulphuric acid and titrated with N/10 permanganate solution.

—W. P. S.

Manganese dioxide; Process for the regeneration of —. P. Hulot. Ann. Chim. Analyt., 1919, 1, 85—87.

Owing to the scarcity and high cost of natural manganese dioxide, various methods have been proposed for the regeneration of dioxide from waste products or the conversion of manganese compounds into the dioxide. These methods include oxidation of manganous oxide with nitric acid, calcination of manganous nitrate or manganous carbonate, fusion of manganous carbonate with potassium chlorate, action of chlorine on manganous carbonate suspended in water; action of manganous chloride on permanganate; and action of sodium hypochlorite on manganous chloride. The products obtained by these methods do not contain more than 70 to 80% of MnO_2 . A product containing 95% MnO_2 may be obtained by treating Weldon mud with 20% nitric acid which dissolves the excess of calcium carbonate and leaves the manganese dioxide unattacked.—W. P. S.

Zirconium oxide; Partial purification of —. A. J. Phillips. J. Amer. Ceram. Soc., 1918, 1, 791—800.

CRUDE zirconia when slintered with sodium carbonate and then leached with weak acid was not freed from iron oxide. Repeated roasting of zirconia with ammonium chloride, sodium chloride, sodium sulphate and carbon, sodium sulphide, sodium fluoride, or sodium fluoride and borax also proved unsatisfactory. Extraction with hydrochloric acid did not reduce the iron oxide below 0.62%. The best results were obtained by passing a current of moist chlorine vertically through the zirconia mixed with 4% of finely powdered petroleum coke, moulded into balls and packed in a cylindrical furnace heated externally to 900° C. (See also J. Chem. Soc., May, 1919.)—A. B. S.

Carbon monoxide in hydrogen; Instrument for the determination of small quantities of —. E. K. Rideal and H. S. Taylor. Analyst, 1919, 44, 89—94.

In the apparatus described the carbon monoxide is oxidised to carbon dioxide by preferential catalytic combustion. The catalyst consists of a mixture of iron and chromium oxides to which small quantities of ceria and thorina are added; between 200° and 300° C., this catalyst oxidises the carbon monoxide completely but does not attack the hydrogen. The hydrogen in which the carbon monoxide is to be determined enters the apparatus through an inlet tube and its volume is measured by a Venturi-type gauge; it then meets a supply of oxygen (obtained by electrolysis of sodium hydroxide solution between nickel electrodes) and is conducted to the catalyst chamber which is heated to about 230° C. The exit gases from the chamber pass to an absorption column filled with glass wool through which is flowing, at regulated speed, a standard (about N/200) calcium hydroxide solution. The latter absorbs the carbon dioxide and, as it leaves the column, is passed through a small electrolytic cell where the conductivity of the solution is measured. A knowledge of the speed of gas and liquid flow and of the strength of the calcium hydroxide solution, and observation of the electrical measuring instrument, enable the percentage of carbon monoxide in the original gas to be obtained, or the percentage may be read directly by using a suitably graduated chart in a recording type of instrument.—W. P. S.

Polyatomic gases; Calculation of the chemical constants of —. A. Langen. Z. Elektrochem., 1919, 23, 25—45.

THE following "chemical constants" (Nernst, Verhandl. Deuts. Phys. Ges., 1916, 48, 102) have been calculated: NO, 0.92; O_2 , 1.021—0.539; CO,

—0.04; N_2 , —0.05; CO_2 , —0.406; H_2O , —1.930; and NH_3 , —2.454. From these values the Einstein function of the specific heat has been calculated and the following values obtained: H_2 , 430; NH_3 , 67.5; H_2O , 30; CO_2 , 7.23; O_2 , 0.736; and NO, 0.543.—J. F. S.

Feld's polythionate process. Sander. See IIA.

Titanium compounds. Barnes. See VI.

Zinc from sulphuric acid chamber sludge. Broughton. See X.

Nitrous fumes in air. Toombs. See XIXb.

PATENTS.

Nitric acid; [Towers for use in the] manufacture of —. B. Dawson, Bradford. Eng. Pat. 123,341, 14.11.17. (Appl. 16,692/17.)

A TOWER for scrubbing the gases from the condensers in the manufacture of nitric acid is provided at the bottom with a tank containing water, a water supply pipe, and a draw-off cock. Below the level of the water is a nozzle or nozzles connected with a compressed air supply, whereby the water is forced upwards and descends again into the tank as a fine spray. An inlet pipe just above the level of the water and an outlet pipe at the top of the tower are provided for the gases.—L. A. C.

Nitrogen oxides; Production of —. E. B. Maxted and G. R. Ridsdale, Walsall. Eng. Pat., 10,781, 26.7.15.

A MIXTURE of ammonia and oxygen is passed at 400° C. to 600° C. over a catalyst containing iron oxide and the oxide or hydroxide of another metal appreciably electronegative to iron and reduced but not melted at the temperature employed in the catalytic oxidation of ammonia, together with the oxide or hydroxide of an alkaline-earth metal. For example, 100 parts by weight of pure crystallised ferric nitrate and 10 parts by weight of pure copper nitrate are dissolved in water and precipitated by the theoretical quantity of sodium hydroxide or sodium carbonate. The precipitate is well washed with hot water, and stirred with a paste containing 15 parts by weight of slaked lime. The mixture is partially dried, formed into lumps, and heated to about 500° C. to give stability. Alternatively, the calcium hydroxide may be incorporated by dissolving 30 parts by weight of calcium nitrate together with the ferric nitrate and copper nitrate, and precipitating as above.—S. S. A.

Pyrites furnaces. E. C. Bracq, Paris. Eng. Pat. 118,094, 4.7.18. (Appl. 11,020/18.) Int. Conv., 22.2.17.

In a pyrites furnace of the type with helical hearths and scraper arms, the mechanism driving the arms is situated beneath the furnace and the shaft is in two separate portions, the upper part carrying the scraper arms being connected to the lower part, which reaches just above the floor of the furnace, by tenons and screw-threaded rods. The upper end of the shaft works in a bearing supported by girders, the other ends of which are secured to pivot pins in the furnace walls. By disconnecting the shaft from the bearing and pivoting the girders about the supporting pins, the top of the furnace can be uncovered and the upper portion of the shaft together with the scraper arms removed from the furnace after loosening the screw-threaded rods connecting the two parts of the shaft.—L. A. C.

Ammonium nitrate; Manufacture of — W. T. Glidden, Oldbury. Eng. Pat. 6048, 22.4.15.

A SUITABLE apparatus for the manufacture of ammonium nitrate consists of a closed vessel provided with a stirrer and thermometer, outlets at the top and bottom respectively for steam and the finished product (the latter opening being closed during the process by a plug), an inlet pipe for ammonia gas reaching nearly to the bottom of the vessel and through which hot air may also be blown if desired, and an inlet for nitric acid. Sufficient water, nitric acid, and ammonia or ammonium nitrate solution is run into the apparatus to seal the ammonia tube, and then, with the stirrer in motion, nitric acid and ammonia gas are passed in simultaneously, the rates of feed being so adjusted that the mixture is kept slightly acid. When the temperature reaches 145° to 155° C., its further increase is checked, if necessary, by the addition of water, but care must be taken that the total amount of water added, including that present in the nitric acid, does not exceed the amount which can be evaporated by the heat of the reaction. The amount of water present in the final product may be reduced to about 0.06% by blowing hot air through the charge for an hour as soon as the addition of the nitric acid and ammonia is complete, and then, after the charge has been run out into trays and allowed to solidify, pulverising it in a disintegrator whilst still hot.—L. A. C.

Ammonium nitrate; Manufacture of — from ammonium bicarbonate or the components thereof and sodium nitrate. F. A. Freeth, Great Crosby, and H. E. Cocksedge, London. Eng. Pat. 12,410, 28.8.15.

AMMONIUM bicarbonate is treated with sodium nitrate in solution of such concentration, that on the completion of the reaction, sodium bicarbonate separates out. This is removed and washed. The liquor which is saturated with sodium bicarbonate, ammonium nitrate, and ammonium bicarbonate at the reaction temperature, is concentrated and cooled, when ammonium nitrate crystallises. This is washed with water and dried, and the washing liquor is used together with the mother liquor from the ammonium nitrate crystallisation and the washing liquor from the precipitated sodium bicarbonate for dissolving fresh quantities of sodium nitrate. For example, a reaction mixture of sodium nitrate and ammonium bicarbonate is prepared so that after the separation of sodium bicarbonate the liquor contains 161 parts by weight of ammonium nitrate, 40 parts by weight of sodium nitrate, and 100 parts by weight of water. The solution is concentrated until it contains 100 parts by weight of sodium nitrate to 122 parts by weight of water. It is then cooled to 25° C., and 40% of the ammonium nitrate originally present in the concentrated solution crystallises.—S. S. A.

Calcium nitrate; Process for the production of — S. Smith, and The Ammonia Soda Co., Ltd., Northwich. Eng. Pats. 10,595, 21.7.15, and 1059, 22.1.16.

CALCIUM chloride solution is treated with excess of sodium nitrate, the liquor is concentrated until the boiling point reaches 140° C., and after removing the sodium chloride which separates, it is cooled to 60° C., thereby producing a further separation of sodium chloride which is removed together with any other salt held in suspension. The remaining clear liquor is diluted until it has a boiling point of 128° C. and further cooled, when calcium nitrate, $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$, crystallises. Artificial cooling may be employed. The process is applicable to the production of pure calcium nitrate from the waste liquor of the ammonia-soda process and from other waste liquors.—S. S. A.

Alumina nitrates; Production of — from clay, argillite, and similar minerals. Norsk Hydro-Elektrisk Kvaestofaktieselskab, Christiania. Eng. Pat. 120,035, 23.7.18. (Appl. 12,001/18.) Int. Conv., 25.9.17.

ALUMINIUM nitrate is prepared from clay, argillite, etc., by heating the mineral with nitric acid, in an autoclave under pressure, whereby dissociation of the nitric acid at high temperatures is prevented. The silica which separates is in a granular state and is easily removed by filtration.—L. A. C.

Nitrogen compounds from carbides; Manufacture of — O. F. S. Carlson, Ljunga Verk, Sweden. Eng. Pat. 123,796, 9.2.18. (Appl. 2386/18.)

CALCIUM carbide intimately mixed with a catalyst (fluorspar, calcium chloride) and with an indifferent substance, is treated with nitrogen in a multistage furnace provided with a stirring mechanism for each shelf. The intensity of the stirring is regulated in inverse ratio to the proportion of substances added to the carbide. The added substances, assisted by the stirring, promote rapid extension of the reaction throughout the mass, and prevent sintering, or dissociation of the calcium cyanamide formed. The product is porous and easily crushed. About 80% of the nitrogen employed is absorbed.—S. S. A.

Magnesium carbonitride; Process of making — in blast-furnaces. E. W. Haslup, Bronxville, N.Y., Assignor to Gilchrist, Haslup and Peacock, Inc., New York. U.S. Pat. 1,291,498, 14.1.19. Appl., 9.8.18.

A MIXTURE of magnesium oxide with sufficient carbon to maintain a reducing atmosphere during the reaction is heated in a blast-furnace to a temperature sufficient to produce magnesium carbonitride, which is withdrawn from the reaction zone as fast as it is formed.—L. A. C.

Sodium monochromate; Process for transforming — into bichromate. Soc. Industrielle de Produits Chimiques, Paris. Eng. Pat. 119,219, 25.1.18. (Appl. 1457/18.) Int. Conv., 31.8.17.

SODIUM chromate is converted into bichromate by treatment with carbon dioxide in the presence of a quantity of water insufficient to dissolve all the sodium chromate at 15° C.; an organic solvent, e.g., ethyl or methyl alcohol, acetone, etc., may also be added. Pressure and agitation assist the reaction. Sodium bicarbonate is removed by filtration, and sodium bichromate obtained from the liquor by evaporation and crystallisation. A very small quantity of water may be employed for the reaction, in which case sodium bichromate is extracted from the product, with water and/or an organic solvent. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 1642 of 1892; this J., 1893, 156.)—L. A. C.

Carbonic acid gas; Manufacture of — F. Barrett, Staines, and A. J. Pennington, Manchester. Eng. Pat. 123,898, 14.5.18. (Appl. 8072/18.)

LIMESTONE is charged into a horizontal retort which is built into a combustion chamber, and heated by the products of combustion from a furnace. A spiral metal coil is fixed in the combustion chamber for superheating steam which is introduced into the retort through a perforated spraying pipe. The products of combustion and the steam are passed through a non-return valve into a cooling coil which condenses the water, and thence to a vessel in which the water is separated and drawn off, whilst the gaseous products pass through one or more scrubbers to a gas-holder or a compression apparatus.—S. S. A.

Extracting apparatus for sulphur. Eng. Pat. 123,645. See I.

Cement and alkali. Eng. Pat. 117,400. See IX.

Concentrating acetic acid. U.S. Pat. 1,291,025. See XVIII.

VIII.—GLASS; CERAMICS.

Glass analysis; Methods of — with special reference to boric acid and the two oxides of arsenic. E. T. Allen and E. G. Zies. J. Amer. Ceram. Soc., 1918, 1, 739–786.

TOTAL arsenic may be rapidly and accurately determined by isolating the arsenic as sulphide, oxidising this to arsenic acid, then reducing with hydrochloric acid and titrating with iodine as recommended by Gooch and Browning (Amer. J. Sci., 1890, 3, 40, 66). 1 grm. of the glass is fused with 3 grms. of sodium carbonate and about 0.1 grm. of potassium nitrate. The fused cake is treated with water, evaporated with 10 c.c. of sulphuric acid (1:1), the solution diluted with hot water, boiled, and the silica and any insoluble sulphates are filtered off under reduced pressure, washed with boiling water, and sucked dry, the total bulk of the filtrate being kept down to 100 c.c. The residue is heated with sulphuric and hydrofluoric acids to remove the silica, then boiled with water and filtered, the filtrate being added to the principal one. To the mixed filtrates a fragment of potassium iodide is added, the solution is heated, and the arsenic precipitated with hydrogen sulphide. After standing over-night, the liquid is filtered, the residue dissolved in a little strong ammonia, or digested with ammonia and ammonium carbonate, 3–5 c.c. of 3% hydrogen peroxide added, and the solution boiled to oxidise the arsenic and decompose the excess of peroxide. The solution is diluted to 100 c.c. with hot water, treated with 0.3 grm. of potassium iodide, and boiled vigorously in a current of carbon dioxide to expel the free iodine. After boiling down to 40 c.c., a little more water and a fragment of potassium iodide are added and the boiling continued, these operations being repeated until reduction of the arsenic acid is complete. The solution is then diluted quickly with 75–100 c.c. of cold water, cooled rapidly in ice water, treated with 12–14 c.c. of a saturated solution of potassium carbonate, neutralised with solid sodium bicarbonate, and titrated with a standard solution containing 1.1 grm. of iodine per litre; 1 c.c. of the iodine solution is equivalent to 0.5 mgrm. As_2O_3 . To determine the quinquivalent arsenic the arsenious acid is removed as arsenic trifluoride by heating the glass with hydrofluoric and sulphuric acids, and the residual arsenic acid is determined as above. This method is not affected by ferrous or ferric iron, chlorine, or platinum. Boric acid may be most satisfactorily determined by Chapin's method (this J., 1908, 1180). Where the amount of boric acid to be determined is very small the use of glass apparatus—which may contain boric acid—should be avoided. The results are not affected by small amounts of fluorides and arsenic. Iron may be determined by decomposing the glass with sulphuric acid and hydrofluoric acid as in determining quinquivalent arsenic, and boiling the residue with water. Lead and arsenic are removed from the filtrate by means of hydrogen sulphide. If zinc is present, the solution is neutralised with sodium carbonate and 0.3–0.5 c.c. of 50% formic acid added before passing the hydrogen sulphide. The filtrate is boiled to expel hydrogen sulphide and the iron precipitated by ammonia in the presence of hydrogen peroxide.

The insoluble sulphates (if any) are leached with ammoniacal ammonium acetate to remove lead sulphate, and the residue is ignited in a platinum crucible, fused with potassium bisulphate, the iron in the product extracted by dilute sulphuric acid and precipitated by ammonia. The combined ferric oxide precipitates are fused with potassium bisulphate, dissolved in water, the solution reduced by hydrogen sulphide, filtered, boiled in a current of carbon dioxide which has been washed with copper sulphate solution, and titrated with permanganate. Jena glasses contain an almost constant amount (0.1–0.2%) of Fe_2O_3 . Zinc is determined by decomposing 1 or 2 grms. of the glass with hydrofluoric and sulphuric acids, precipitating the arsenic as sulphide in acid solution, then nearly neutralising the filtrate and precipitating the zinc as sulphide. Alternatively, the arsenic and zinc may be precipitated together in a slightly acid solution, the precipitate dissolved in hot hydrochloric acid (1:1), and the zinc determined by evaporating to dryness with sulphuric acid, heating to redness, and weighing the zinc sulphate; by precipitating with sodium carbonate, filtering, igniting, and weighing as carbonate; or by evaporating with sulphuric acid, cooling, diluting to 100 c.c., adding an excess of caustic soda, acidulating with 0.5 c.c. of glacial acetic acid, diluting to 150 c.c., and electrolysis at the ordinary temperature, using a rotating platinum cathode coated with copper and a potential difference of less than 4 volts. Lead and barium in glass are best determined by precipitating them simultaneously as sulphates, and determining the barium directly in a separate portion. Aluminium may be separated from barium and calcium either by precipitating it cold with ammonium sulphide in faintly ammoniacal solution, allowing to stand all night, filtering, dissolving the precipitate and precipitating the alumina with ammonia, or by a double precipitation with ammonia in the usual manner. As the proportion of alumina in glasses is small, the ammonia used should be free from alumina and silica and should be kept in gold or ceresin bottles. In the analysis of borosilicate glasses after separation of the silica as described above, the residue should be evaporated twice with methyl alcohol to remove boric acid. Alkalies are preferably determined by the Lawrence Smith method, the mixed chlorides being treated with methyl alcohol to expel any boric acid. Gases occluded by glass are determined by heating *in vacuo* in a silica tube at 1200° C. and analysing the gases in the customary manner.—A. B. S.

Arsenic in glass; Condition of — and rôle in glass-making. E. T. Allen and E. G. Zies. J. Amer. Ceram. Soc., 1918, 1, 787–790.

THE major part of the arsenic in all the glasses examined by the authors was in the quinquivalent state, but a portion was present in the trivalent state. With regard to the part played by arsenic in removing small bubbles from glass ("fining"), careful analyses indicate that up to 30% of the arsenious acid added is lost by volatilisation; some is oxidised even at low temperatures, but the product slowly dissociates at a higher temperature into oxygen and arsenic trioxide, both of which assist in the fining.—A. B. S.

Clays; Microscopical examination of —. R. E. Somers. J. Wash. Acad. Sci., 1919, 9, 113–116.

QUARTZ in medium or coarse grains is readily distinguished by means of its index of refraction, low interference colour, and lack of cleavage. Smaller grains of quartz resemble kaolinite, from which it is distinguished by its more angular shape and more rapid extinction. Kaolinite—when sufficiently large—is distinguished by its low index of refrac-

tion, low birefringence, flaky nature, and a tendency to form fan- or worm-shaped bunches. The smallest particles show as minute transparent plates with a low interference colour and an index of refraction close to that of the balsam used as mounting medium. Hydromica represents a transition stage between sericite and kaolinite, due to weathering. It has single and double refractions higher than those of kaolinite, but lower than those of muscovite or sericite. Hydromica forms "fans" similar to those of kaolinite, but it may occur in larger grains. Halloysite occurs in plate-like grains and is isotropic. Rutile was present in every clay examined, sometimes in grains or prisms 0.015–0.020 mm. diam., but more generally as minute needles, 0.001–0.010 mm. diam. and 5 or 6 times as long as they are wide. The interference colour is of the first order, but the particles are so small that the birefringence is very high. Tourmaline is well marked by its pleochromatism. Epidote is occasionally seen as a greenish mineral of moderate single and double refractions. Zircon and titanite are frequently present as grains of high refractive index and high birefringence; titanite may be distinguished from zircon by its higher interference colour. Diaspore occurs in regular grains with a moderately high refractive index and double refraction; it may be separated from clay and quartz by means of bromoform (sp. gr. 2.8) in which diaspore (sp. gr. 3.4) sinks whilst the other minerals float. The relatively coarse particles of clays average 0.100 mm. or more in diam., the medium grains 0.020–0.025 mm., and the fine grains 0.010 mm. or less. In clays which have been fired at 950°, 1150°, and 1300° C. respectively and then ground to thin sections, quartz grains are more clearly visible under the microscope than in the raw clay. Hydromica disappears or loses the greater part of its interference colour when heated to 1150° C., unless the grains are very large. Kaolinite appears to retain its shape and much of its interference colour. Tourmaline and epidote disappear at 1150° C., but rutile, zircon, and probably titanite seem to be unaffected at 1300° C. Sillimanite was observed in a Florida clay fired at 1300° C.; it was probably formed from kaolinite or hydromica, as one composite flake of kaolinite and sillimanite was observed. In some clays a double refraction is produced in the ground mass by firing at a sufficiently high temperature. The relative proportions of the above-mentioned minerals in a large number of American clays are shown in tabular form.

—A. B. S.

Slag; Influence of temperature upon the action of — upon refractory materials. R. M. Howe. Chem. and Met. Eng., 1919, 20, 167–168.

A LABORATORY test of the penetration of slag (35 grms.) contained in a cavity ($2\frac{1}{2}'' \times \frac{1}{4}''$) bored in a firebrick gives a reliable relative indication of the service of bricks in works practice. At any given temperature of testing, variation of the time factor and the quantity of slag have no pronounced effect, and a reaction time of 2 hours is in general use. Increase in temperature has a marked influence and in several cases an increase of 100° C. resulted in nearly doubling the area of penetration. The lives of furnace linings should not be compared on a daily, or tonnage, basis when one furnace is worked at a moderate, and another at a forced rate, as if a furnace is operated at a higher temperature so that the output of metal is increased by 50%, it cannot be expected to last even two-thirds as long (during which time equal tonnage would have been produced) as if worked under the normal conditions.

—C. A. K.

Purifying zirconia. Phillips. See VIII.

PATENTS.

Electrical apparatus for subjecting articles to varying temperatures [e.g., for annealing glass]. W. E. Prescott, Harlesden, and G. R. Baker, Willesden. Eng. Pat. 123,545, 22.12.17. (Appl. 19,041/17.)

A SERIES of receptacles attached to a conveyor is caused to pass at a desired speed through a chamber, the receptacles being provided with a number of electrical resistances, the terminals of which make movable contact with suitable contacts in the chamber so that the temperature therein may be raised or lowered, as required, by varying the voltage of the electric current employed as a heating agent. The apparatus is specially useful for annealing glass.—A. B. S.

Millstones; Artificial — and the manufacture thereof. W. S. and G. S. Barron, Gloucester. Eng. Pat. 123,377, 18.2.18. (Appl. 2848/18.)

A HARD abrasive material such as emery, corundum, French burr, or quartz is granulated, mixed with 25–33% of its weight of Portland cement and a suitable proportion of calcium chloride solution of sp. gr. 1.04, and made into the desired shape. After the initial set, the stone is immersed in water for 3 weeks, then dried for 3 weeks in a chamber through which are passed sulphur-free furnace gases. The dry stone is then immersed for 4 or 5 days in a solution of alkali silicate of sp. gr. 1.08, washed in hot water, and dried.—A. B. S.

Glass and batch therefor. W. C. Taylor, Assignor to Corning Glass Works, Corning, N.Y. U.S. Pats. 1,292,147 and 1,292,148, 21.1.19. Appl., 27.3.16. Renewed 25.6.18.

SEE Eng. Pats. 118,397 and 118,398 of 1918; this J., 1918, 584 A.

Aluminous abrasives and process of making the same. Norton Co., Worcester, Mass., Assignees of L. E. Saunders and R. H. White, Niagara Falls, N.Y., U.S.A. Eng. Pats. 113,959 and 118,592, 7.2.18. (Appls. 2254 and 2257/18.) Int. Conv., 12.2.17 and 2.8.17.

SEE U.S. Pats. 1,240,491 and 1,263,710; this J., 1917, 1130; 1918, 418 A.

Sealed-in wires for glass bulbs. Ger. Pat. 309,343. See IIB.

IX.—BUILDING MATERIALS.

PATENTS.

Cement; Method of manufacturing simultaneously hydraulic — and alkali from alkaliferous mineral substances and lime. Patentaktiebolaget Jungner's Kali-Cement, Norrköping, Sweden. Eng. Pat. 117,460, 11.7.18. (Appl. 11,369/18.) Int. Conv., 11.7.17.

A MIXTURE of an alkaliferous mineral, such as felspar, and lime is burned in a fuel-heated shaft or rotary kiln at about 900° C. to expel water and carbon dioxide, and the hot mass is then transferred to a resistance or radiating electric furnace and heated at about 1450° C. until sintering occurs, the alkali being volatilised. The alkali is recovered in a purer form than when the whole of the heating is effected by fuel. A suitable electric furnace consists of a tilting or semi-rotary cylinder lined with refractory material and containing a number-

of parallel plates of carbon or graphite which are placed longitudinally in the cylinder and are supported at each end by alternate blocks of conducting and non-conducting material. Electrical contact is made through pieces of conducting refractory material which are pressed on to the plates by means of screws extending outside the cylinder and serving as terminals. The calcined material is introduced into the spaces between the carbon plates. The volatilised alkali is collected on the metal cover of the electric furnace, and when the heating is finished the cover, with the adherent alkali, is removed and the cement-clinker in the body of the furnace is discharged by tilting the cylinder. The alkali may be carbonated, if desired, by placing the cover with its contents in a chamber through which the gases from the calcining chamber are passed.—A. R. S.

Bricks and the like and process of making the same. A. C. Spencer, Washington, D.C. U.S. Pat. 1,269,331, 11.6.18. Appl., 24.8.17.

A MIXTURE of lime and greensand or glauconite (a double silicate of potassium and iron) is heated until the particles are softened externally and is then compressed into bricks or other structural shapes. For example the clinker obtained by the process described in U.S. Pat. 1,209,219 (this J., 1917, 218) may be moulded whilst still hot and plastic.—A. B. S.

Waterproof cement; Process for making — and the product thereof. H. M. Olson and F. J. D. Westell, Los Angeles, Cal., U.S.A. Eng. Pat. 123,695, 26.9.18. (Appl. 15,712/18.)

SEE U.S. Pat. 1,283,546 of 1918; this J., 1919, 77 A.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron and steel; Unification of methods for the analysis of —. A. Marinot. Ann. Chim. Analyt., 1919, 1, 87—93. (See this J., 1919, 143 A.)

THE following methods are suggested. *Nickel.* In the absence of chromium this metal is determined electrolytically after ferric chloride has been removed by extraction with ether. If chromium is present, the cyanide method is recommended. One grm. of the metal is dissolved in nitric acid, the solution diluted with water, treated with 50 grms. of ammonium chloride and a large excess of ammonia, cooled, diluted to 500 c.c., and filtered; 250 c.c. of the filtrate is neutralised with hydrochloric acid, 2 c.c. of ammonia, 10 c.c. of 4% potassium iodide solution, and exactly 5 c.c. of 0.2% silver nitrate solution are added, and the mixture is titrated with potassium cyanide solution which has been standardised against the silver nitrate solution and a solution containing a known amount of nickel. The silver iodide first formed is dissolved completely by the cyanide solution only when the double salt (potassium nickel cyanide) is formed, and the disappearance of the last trace of silver iodide is taken as the end-point. *Chromium.* The solution resulting from the determination of the manganese (*loc. cit.*) is treated with nitric acid, any pink coloration which develops is destroyed by the addition of arsenious acid solution, 10 c.c. of the latter is then added in excess, and the mixture is titrated with permanganate solution. Three mols. of arsenious acid are equivalent to 4 mols. of chromic acid (CrO_3). *Copper.* is precipitated as sulphide by means of sodium thiosulphate in acid solution, the sulphide is ignited to oxide, the latter dissolved, and the

copper determined iodometrically. *Titanium.* The portion of the metal insoluble in potassium cupric chloride solution (Carnot and Goutal, this J., 1899, 521) is ignited, treated with hydrochloric acid, and fused with a mixture of potassium nitrate and potassium carbonate; the mass is treated with water, the insoluble portion fused with potassium bisulphate, the mass dissolved in sulphurous acid solution, filtered, the filtrate treated with acetic acid and sodium acetate, boiled, and the precipitated titanate collected, ignited, and weighed. *Aluminium.* After the greater part of the iron has been separated by the ether extraction method, the remaining iron and the aluminium are precipitated as hydroxides; the precipitate is dissolved in hydrochloric acid, the solution treated with concentrated sodium hydroxide solution, the mixture heated, cooled, and an aliquot portion of the clear liquid treated with ammonia. The precipitate is collected, re-dissolved in hydrochloric acid, and the aluminium precipitated as phosphate in the presence of a slight excess of ammonia. *Tungsten.* Silica and tungsten are separated together by dissolving the metal in nitric acid and evaporating the solution with the addition of sulphuric acid in the usual way; after ignition, the silica is removed by treatment with hydrofluoric acid and the residue of tungstic acid is weighed.—W. P. S.

Iron; Determination of oxygen in —. P. Oberhoffer. Stahl u. Eisen, 1918, 38, 105—110.

A DESCRIPTION of the construction and use of apparatus for the determination of oxygen in iron. The metal is heated to 900°—1000° C. in a current of hydrogen (generated by electrolysis of one-third saturated caustic potash) in a quartz tube in an electric resistance furnace. The total time required for an estimation is one hour.—W. R. S.

Phosphorus in steel, cast iron, and basic slag; Estimation of —. A. Travers. Chim. et Ind., 1919, 2, 133—141.

THE high results usually obtained by the phosphomolybdate method of determining phosphorus are due to precipitation of MoO_3 , along with the phosphomolybdate; in a properly conducted estimation, the error due to silica and iron oxide is negligible. To obtain complete precipitation of the phosphomolybdate an excess of molybdate must be employed, together with a corresponding excess of ammonium nitrate, and to avoid precipitation of free MoO_3 , the separation is effected in a strongly acid (HNO_3) medium. Thus 1 grm. of steel is treated with 15 c.c. of nitric acid of 24° B. (sp. gr. 1.2), a few c.c. of permanganate solution (20 grms. per litre) is added, and the precipitated manganese dioxide redissolved by addition of sodium nitrite. 10 c.c. of nitric acid of 36° B. (sp. gr. 1.33) is added and the solution boiled for 3 or 4 minutes. Then 25—30 c.c. of molybdate reagent is added, and the precipitation is hastened by scratching the beaker with a glass rod. After a few minutes the precipitate is centrifuged. The total error in the results obtained by this rapid method, including experimental error and traces of SiO_2 and Fe_2O_3 , is not greater than 0.005%. The nitric acid should not contain arsenic. Hydrofluoric acid and fluorides retard the precipitation of the phosphomolybdate, and may prevent it entirely.—S. S. A.

Galvanised sheet iron; Resistance of — to rusting. M. Schöttler. Stahl u. Eisen, 1918, 38, 243—248.

THE comparative rates of corrosion of 20 samples were determined by dipping them in dilute sul-

phuric acid and weighing them at regular intervals until all the zinc was removed, which was easily ascertained by the cessation of the evolution of gas. All the samples of material galvanised in a bath of molten zinc were stripped after less than 1 hour's immersion, while those coated electrolytically required more prolonged contact. This may be explained by the greater purity of the electrolytic deposit, which behaves like a sheet of pure zinc until sufficiently porous to expose some of the iron, when galvanic action is induced. In judging the resistance to corrosion, the time at which the corrosion curve attains its maximum should be considered, not that required to remove the whole of the zinc.—W. R. S.

Iron-carbon-chromium alloys; Structure of —. T. Murakami. Twenty-fourth Report of the Alloys Research Inst. Sci. Rep. Tôhoku Imp. Univ., 1918, 7, 217–276.

THE existence of Cr_3C is confirmed and a eutectic of Cr_3C and a solid solution of carbon in chromium shown to exist. The A2 point in steels is lowered by the addition of chromium. The following double carbides of iron and chromium are stated to exist: $(\text{Fe}_3\text{C})_{18}\text{Cr}_3\text{C}$, $(\text{Fe}_3\text{C})_9\text{Cr}_3\text{C}$, and $\text{Fe}_3\text{C}\cdot\text{Cr}_3\text{C}$. The first of these is magnetic, with a critical point at 150°C ; the other two are non-magnetic. By etching with an alkaline solution of potassium ferricyanide these three compounds may be distinguished from each other. The first is coloured brown both by boiling alkaline ferricyanide and by boiling sodium picrate, the second is coloured by the boiling ferricyanide but not by the picrate, while the third is coloured brown to blue in the cold. Cr_3C dissolves in the austenite above Ac 1, and on further heating dissociates according to the equation $2\text{Cr}_3\text{C} = \text{Cr}_3\text{C}_2 + 5\text{Cr}$. On cooling the reverse process takes place only slowly and the dissolved chromium is responsible for the lowering of the Ar 1 point. If the rate of cooling through 700°C . be sufficiently slow the normal Ac 1 point is found. A specimen which has a normal transformation point is troostitic or pearlitic, one having a lowered transformation is martensitic, while if the change is completely suppressed the steel is austenitic. The hardness of chrome steel is caused by the solid solution of Cr_3C , and chromium in iron. By the addition of chromium the Ac 1 and Ar 1 points are raised and for high chrome steels the Ac 1 point is above Ac 2. The temperatures of the critical points for certain steels cooled from 900°C . were as follow:

Cr %	C %	Cooling			Heating		
		Ar 1	Ar 2	Ar 3	Ac 1	Ac 2	Ac 3
		$^\circ\text{C}$.	$^\circ\text{C}$.	$^\circ\text{C}$.	$^\circ\text{C}$.	$^\circ\text{C}$.	$^\circ\text{C}$.
4.44	0.27	650	720	850	830	760	830
9.32	0.39	640	700	640	840	760	840
13.7	0.74	640	690	640	840	760	840
0.86	0.98	680	680	680	780	780	780
4.42	0.95	685	685	685	790	790	790
9.33	1.09	690	690	690	820	780	820
24.3	0.65	Abs.	Abs.	Abs.	Abs.	Abs.	Abs.

The specific resistances of some of the samples are tabulated.

Chromium-carbon alloys with more than 5% of carbon are not acted on by any acid, even *aqua regia*. The "saturation" point of chrome steels, i.e. carbon per cent. at which ferrite ceases to occur, is lower than that of iron-carbon alloys, e.g., 0.62 for 5% Cr, 0.45 for 10%, 0.35 for 15%, and 0.25 for 20% Cr. In the same way the carbon per cent. at which the "pig iron" eutectic (ledeburite) is first found is lowered by chromium from 2% in steel free from chromium to 0.6% for a content of 20% Cr. (See also J. Chem. Soc., May, 1919.)—F. C. Th.

Electric ferromanganese furnaces; Eliminating phosphorus and sulphur in —. J. Loneragan. Chem. and Met. Eng., 1919, 20, 245.

AN attempt to smelt a high-phosphorus ore (0.32% P) with excess of lime failed, as the resulting ferromanganese contained 0.6% P. Tables are given to show the proportion of sulphur and phosphorus which can be eliminated in ordinary practice. The distribution of the elements is expressed as a percentage of the total sulphur and phosphorus charged into the furnace.

	Sulphur	Phosphorus
Metal	1.148	52.6
Slag	34.60	14.75
Dirty metal and slag...	4.75	6.06
Dust and volatilisation ...	59.40	31.40
(by difference)		

It is assumed that the greater part is lost mechanically and that the phosphorus in the dust retains its original form. Calculating for a maximum of 0.25% P in the metal, and making allowance for the phosphorus content of the coal and lime, the maximum allowable percentage of phosphorus in a manganese ore is 0.17%. This figure has been substantiated by a furnace run of several months' duration.—C. A. K.

Copper; Influence of cold rolling upon the mechanical properties of oxygen-free —. F. Johnson. Inst. of Metals, Mar., 1919. [Advance copy.] 12 pages.

THE break in the curve of the tenacity of cold-rolled copper against the corresponding reduction of area during rolling discovered by Alkins (this J., 1918, 587a) for tough-pitch copper is fully confirmed for oxygen-free electrolytic copper. A second break, which was not however beyond doubt, appeared to exist for a 80% reduction. Results of the same order are obtained whether the tests are carried out on the materials as cast or in the annealed condition.—F. C. Th.

Corrosion of brass in sea-water. P. T. Bruhl. Chem. and Met. Eng., 1919, 20, 239.

THE effect of strain in the metal is not serious, as the method of manufacture does not permit of a difference in solution pressure greater than 0.0002 volt. Annealing increases the E.M.F. but the effect is small; rolling also imparts added energy to the metal. Bilge water and oil are harmful owing to the formation of corrosive sulphur compounds from the former and the hydrolysis of the oil by steam with the production of free acid. The rate of corrosion must be increased by the voltaic couples formed within the metal between the products of corrosion and the metal itself, and the deposits which are generally conceded to be injurious are the green oxychloride (which promotes de-zincification), carbon, and ferric hydroxide. Muntz metal, which consists of the alpha and beta phases, corrodes more rapidly than ordinary brass, which consists of the alpha phase only. In general, increase in temperature or an increase in the amount of carbon dioxide present, accelerates the corrosion of brass.—C. A. K.

Copper alloys; Properties of some —. W. Rosenhain and D. Hanson. Inst. of Metals, Mar., 1919. [Advance copy.] 12 pages.

FOR copper-manganese and copper-manganese-aluminium alloys a process of pressure casting was adopted. The crucible containing the molten alloy was placed on a firebrick stand in an enclosure.

in which the pressure could be raised to 30 lb. per sq. in. The molten metal was thus forced up an iron tube, $\frac{1}{4}$ in. internal diameter, into the hot mould to be filled. The bottom of the mould was heated to 500°–600° C. The pressure—which was at first regulated so that the mould was filled without splashing—was increased to 30 lb. per sq. in. and maintained until the metal had solidified. The manganese-copper alloys were deoxidised with 0.25% of aluminium and broken down in the rolls at 800° C. For annealing a temperature of 650° to 750° C. is satisfactory; the adherent oxide film formed on the surface is removed by pickling the hot alloy in hydrochloric acid of sp. gr. 1.1. The following results were obtained for the metals as rolled and after being annealed at 650° C. for half an hour:—

Al	Mn	Condition	Yield point, tons per sq. in.	Ultimate stress, tons per sq. in.	Elongation, % on 2½ in.	Brinell no.
%	%					
3	0	Rollled ..	26.6	26.8	9	138
		Annealed ..	5.8	17.7	55	60
5	0	Rollled ..	34.3	35.1	17	175
		Annealed ..	8.3	25.5	70	85
7	0	Rollled ..	38.7	39.8	18	195
		Annealed ..	7.0	27.5	71	76
3	1	Rollled ..	26.2	26.8	11.5	142
		Annealed ..	10.0	20.2	50	73
5	1	Rollled ..	28.7	31.1	27	163
		Annealed ..	12.0	26.3	57	90
7	1	Rollled ..	34.1	35.5	28	184
		Annealed ..	11.5	29.3	65	100
2	5	Rollled ..	29.6	29.9	9	145
		Annealed ..	10.4	22.4	45	83
4	5	Rollled ..	35.0	35.7	16	182
		Annealed ..	11.3	26.7	55	95
0	5	Rollled ..	29.3	29.3	9	150
		Annealed ..	9.2	21.0	45	81

In the case of copper-zinc and copper-zinc-nickel alloys, borax as a flux was eminently satisfactory. These were not pressure cast.

Cu	Mn	Zn	Ni	Pb	Condition	Yield point, tons per sq. in.	Ultimate stress, tons per sq. in.	Elongation, % on 2½ in.
%	%	%	%	%				
95.5	4	—	—	0.5	Rollled ..	30	38	4.5
					Annealed ..	11	21	35
88	2	10	—	—	Rollled ..	35	37	5
					Annealed ..	8	21	41.5
87	3	10	—	—	Rollled ..	42	47	3
					Annealed ..	11	23	35
85	—	5	10	—	Rollled ..	31	34	—
					Annealed ..	8	20	—
83	—	7	5	—	Rollled ..	27.5	32.5	—
					Annealed ..	7	19	40.5
80	—	10	10	—	Rollled ..	35	39	3
					Annealed ..	10	21	35

—F. C. Th.

Metals; Corrosion of —. Fourth Report to the Corrosion Committee of the Institute of Metals. G. D. Bengough and O. F. Hudson. Inst. of Metals, Mar., 1919. [Advance proof.] (See also this J., 1917, 219; 1913, 913; 1910, 471.)

THE authors have studied the action of distilled water and sea-water on copper and zinc in some detail, and conclude that the initial action is a process of chemical oxidation rather than electro-chemical displacement. Metallic zinc is normally covered with a partially protective scale, which consists largely of oxide or basic carbonate. Water containing carbon dioxide can attack or dissolve the oxidised layer, and zinc can then be found in solution as a slightly soluble bicarbonate. The attack on the scale begins at certain points, and

a true metallic surface is exposed to the action of the water. At such places a peculiar form of oxide is formed on the surface of the metal. Probably this oxide contains zinc peroxide, and catalyses the corrosion of the underlying metal. It is slightly soluble and passes into solution, and is afterwards largely precipitated as the ordinary hydroxide and carbonate. The precipitated hydroxide has a distinctly protective action on the metal beneath it, and reinforces the original scale and enables it to resist the action of carbon dioxide. The action is thus localised. In the presence of very large amounts of carbon dioxide, as for instance, when the water is kept saturated by bubbling carbon dioxide through it, the products of corrosion are largely kept in solution and local action is almost entirely avoided, though the total amount of corrosion that takes place is increased. When metallic copper free from oxide is immersed in water a lower oxide Cu_2O or Cu_3O_2 is immediately formed over the surface. This may become further oxidised at irregularly distributed spots, and the product thus formed does not protect the underlying metal from oxidation to the same extent as does the original tarnish layer. The dark oxidation product itself, which is probably a cupric hydroxide or basic carbonate, tends to flake off the metal, probably owing to the formation of bulky oxidation products beneath it. The latter are porous, and apparently amorphous, and probably act catalytically by increasing the rate of oxidation of the underlying metal. The amorphous oxide is slightly soluble, but it is finally precipitated from solution as crystalline cuprite, which has a lower solubility than the amorphous oxide. The result of the action ultimately is to cause shallow pits in the metal. Such pits are much less important than in the case of zinc. Experiments made to ascertain the effect of coupling together electrodes of different metals and immersing them in different electrolytes have led to the view that the effect of couples in some of the practical problems of corrosion has been over-emphasised. The local severe pitting at or near the water-line in the case of aluminium and certain light alloys when immersed in distilled water and sea-water is considered to be due to the presence of a strongly acid salt. The nature of the action of distilled water on 70:30 brass has been studied in detail by means of the microscope and by analytical methods. The action is considered to be the chemical oxidation of the copper and zinc, and the partial solution of the oxidised products. Most of the zinc passes into solution, in the presence of carbon dioxide, and part of the copper, the remainder of both metals remaining on the surface of the alloy as an oxide scale. The scale becomes further oxidised and altered at certain spots which become covered with thick deposits of the products of attack. Such deposits are porous and allow, and probably accelerate, local attack on the underlying metal. The attack is accompanied by re-deposition of copper by displacement by the zinc either electro-chemically or otherwise, and precipitation of cuprite. There are signs of slight local dezincification at such places, but the attack over the general surface of the alloy is complete corrosion. The positions at which local attack and pitting take place are not determined by the variation in the electrical properties of the original metal, but by the conditions of the experiment. In the presence of dilute acids, such as hydrochloric and sulphuric, local action of the type described does not occur, since there is little or no local accumulation of oxidation products. On the other hand, the absence of carbon dioxide retards the action. The action of sea-water is considered to be similar in type. Local pitting and dezincification are due to the accumulation

of the products of corrosion. The rate of corrosion is much greater than that in distilled water, and does not fall off so rapidly with time. At the ordinary temperature there is less tendency to local dezincification. Different batches of condenser tubes of 70:30 brass have been found to possess surface layers differing in behaviour from the underlying metal towards corrosive agents. It may become possible to adapt the surface layer to the conditions under which the tubes will be used. Local action initiated in condenser tubes by such bodies as clinker and coke is associated with the accumulation of products of corrosion and may be largely assisted by them. It is usually characterised by intercrystalline oxidation. Acidified water (5 to 10 parts of acid in 100,000 of water) produces accelerated corrosion and alters the type of action. Admiralty condenser tubes (Cu 70, Zn 29, Sn 1) are decidedly more resistant than 70:30 brass to the action of dilute acids. As regards the practical problem of protecting condenser tubes from corrosion the authors consider that no one single remedy is likely to be found effective for all the different kinds of attack which occur in practice. The nature of the tubes used and the protective measures chosen should be dependent on the particular set of conditions. A list is given of the characteristics which the cooling water should possess, and the chief causes of corrosion are tabulated with notes as to their action, together with suggested remedies. The effect of the presence of scale on the rate of corrosion is considered to be of great importance, and of the substances commonly occurring in scale, calcium carbonate is one of the most important. This compound may exert almost any kind of effect, according to its physical condition, from a considerable degree of protection to a serious attack. Observations of the working of the Cumberland process (this J., 1916, 51) at a power station near Brighton have shown that, under the conditions prevailing, a prolonged life of the tubes is ensured, provided that the process is applied to new tubes. The authors consider that the thin uniform scale which is maintained on the tubes by the process is an important factor in preventing serious corrosion. One of the important functions of the scale is to prevent contact between the tube and harmful deposits and products of corrosion; in addition, it retards, but does not entirely prevent, the general oxidation of the tube. Other possible methods of protection are briefly considered, and a preliminary account is given of a pre-oxidising process for reducing the rate of corrosion.—T. St.

Zinc; Electrolytic deposition of — [from sulphuric acid chamber sludge]. H. E. Broughton. *Chem. and Met. Eng.*, 1919, 20, 155—162.

In the semi-pyritic method of smelting copper-zinc ores, all the zinc is lost, the greater part passing away as a fume containing over 40% of zinc, chiefly in the form of zinc sulphide, with smaller quantities of oxide and sulphate. The fume is carried over into the acid chamber and converted into zinc sulphate, and a sludge insoluble in the chamber acid is formed. Zinc sulphate is obtained together with other soluble sulphates by the agitation of the sludge with water, and lead sulphate and insoluble materials are allowed to settle. Purification of the clear liquor is necessary before electrolysis as elements electro-negative to zinc are present. The solution is neutralised and iron salts are precipitated by addition of marble, the precipitate being separated by an Oliver continuous filter. The liquor is then treated with metallic zinc to precipitate metals of lower potential, e.g., copper, cadmium, bismuth. The time factor at this stage is important, and a slightly acid solution accelerates the reaction. Cadmium is never completely removed

and as the deposited cadmium tends to re-dissolve, the liquor is quickly filtered without settling. Electrolysis is carried out in lead-lined wooden tanks with lead anodes and aluminium cathodes suspended from, and rigidly fastened to, aluminium bars above the tank. A current density of 17–20 amps. per sq. foot has been found most satisfactory, and in practice a 70% current efficiency is obtained. The presence of alkali sulphates has not a marked effect, but the use of a small quantity of an organic additive agent (glue) leads to more regular operation and less heating. The metal obtained is of superior quality, the impurities being 0.05% Cd, 0.03% Pb, and 0.02 Cu (Fe). In melting the metal slabs produced by electrolysis an addition of ammonium chloride prevents sponginess of the metal, and reduces loss of zinc by oxidation.—C. A. K.

Lead and zinc; Metallurgy of the dry processes for the extraction of — K. Friedrich. *Metall u. Erz*, 1919, 16, 21–31.

LOSSES in the recovery of lead are due to volatilisation of lead or lead compounds during the roasting etc., to removal of lead in the slag in the blast furnace, and to volatilisation etc. in the later processes of desilverisation etc. With modern plant and practice the loss during roasting can be kept down to 1% and a part of the volatilised lead will be condensed and can be recovered. This loss is partly mechanical, i.e., dust, and partly true volatilisation, and the former can be considerably reduced. A well-sintered ore gives a considerably lower loss through dust formation in the blast furnace. The acid constituents of the gases from the roasting apparatus may be neutralised by limestone or zinc oxide. The most important of all the losses in the extraction of lead occurs in the finishing slag of the blast furnace, which contains 1.5%. Of the losses in the gases from the blast furnace 95% may be recovered by efficient condensation. Continental practice is tending ever towards poorer charges, down to 10% of lead, at which figure every 0.1% lead recovered from a slag containing 1.5% represents an increased yield of 0.9%. The volatilisation losses during the working up of the lead may be neglected. A lead-zinc alloy melted under lead chloride at 515° C. will be found on analysis to be free from zinc if the slag contains more than 4% of lead chloride; this may form the basis of a dezincification process. Silver sulphate from argentiferous sulphide ores commences to decompose at 1040° C. The addition of zinc oxide lowers this temperature to 1020° C., limestone to 500° C., magnesia to 510° C., lead oxide to 460° C., strontium oxide to 410° C., and barium oxide to 310° C. The losses in the extraction of zinc include the loss as dust and by leaching during storage; as dust and by volatilisation in roasting; and during distillation due to flaws in the furnace, to incomplete mixing of the ore with the reducing material, to the formation of dust, and to the presence of sulphur and iron in the roasted blends. The last source of loss is dependent on the skill with which roasting is carried out. The loss of zinc during roasting is about 1%. The elimination of the sulphur is never complete, 4–5% of the total sulphur remaining, the greater part as sulphate. Abnormally high losses in distillation—say 12%—are due to the flaws in the refractory material from which the furnace is made.—F. C. Th.

Aluminium and its alloys; Micrography of — D. Hanson and S. L. Archbutt. *Inst. of Metals*, Mar., 1919. [Advance copy.] 14 pages.

Iron occurs in aluminium and most of its alloys as FeAl₃, which is practically insoluble in solid aluminium; 0.1% of iron is readily detected. The compound is hard and whiter than aluminium

itself. Silicon forms a eutectiferous series with aluminium, the eutectic at 10.5% Si having a melting point of 570° C. Silicon in a micro-section appears somewhat darker than FeAl_3 . The most suitable reagents for etching aluminium are 20% caustic soda and dilute hydrofluoric acid (not stronger than 5%). A 10% solution of hydrofluoric acid is useful to reveal the crystalline boundaries of aluminium itself; for the alloy caustic soda is better. CuAl_2 is best distinguished from FeAl_3 by etching with 20% nitric acid at 70° C. for two or three seconds. CuAl_2 is then coloured dark brown while FeAl_3 , and most other constituents are unattacked. Zinc in commercial aluminium alloys is in solid solution and zinc-aluminium alloys are best etched for one minute in the caustic soda solution and the tarnish removed with an aqueous solution of chromic acid. Nickel forms with aluminium a compound NiAl , which has a very limited solubility in solid aluminium, and occurs as a hard white constituent very similar to FeAl_3 . NiAl is coloured brown by 5% hydrofluoric acid or 10% caustic soda.—F. C. Th.

Chrome ironstone [chromite]: Errors in the analysis of —, and a new process. J. Moir. J. S. Afr. Assoc. Anal. Chem., 1919, 2, 9—16.

Tests with synthetic mixtures containing known quantities of chromium showed that by the usual methods—fusion with sodium peroxide, alkali carbonates and nitrate, or potassium bisulphate—errors, generally minus, amounting to 10% of the quantity of chromium present are quite possible. By the following modification of the sodium peroxide fusion method the quantity of chromium found averaged 99.6% of that present, with a total variation of about 1%:—The finely-ground chromite is gently heated with 6–8 times its weight of sodium peroxide, in a thick, deep, iron crucible, until the initial effervescence ceases, and the melt is then maintained at low redness for 10 mins. (being agitated by rotation meanwhile), cooled, and extracted with water. After the addition of sufficient sulphuric acid (20%) to effect complete solution, 2 grms. of potassium persulphate or 3–5 grms. of ammonium persulphate is added to the liquid, which is then heated, at first rapidly to 80° C. and then slowly to boiling. The excess of persulphate is removed by diluting the liquid with about 25% of its bulk of sulphuric acid (20%) and boiling for 30 mins., and the solution is then cooled, diluted, and titrated with excess of standard ferrous ammonium sulphate followed by potassium permanganate. A marked red-brown colour in the final solution indicates the presence of permanganic acid (from manganiferous ore); it is discharged before titration by the addition of 2 drops of concentrated hydrochloric acid or about 1 mgrm. of benzoic acid to the nearly boiling liquid.—W. E. F. P.

Tungstic oxide: Reduction of —. C. W. Davis. J. Ind. Eng. Chem., 1919, 11, 201—204.

For the satisfactory reduction of tungstic oxide all water must be removed by drying in a current of air at about 500° C. When dried in a current of air at 100° C. the precipitated oxide retains 3.7% of water. The dried oxide is mixed with carbon by grinding together in a tube-mill with steel or wooden balls. At 650° to 850° C. the reduction produces a blue or purple oxide; at 900° to 1050° C. a chocolate brown mixture of oxides is obtained, whilst above 1050° C. a grey powder of metallic tungsten is left. To prevent oxidation the reduced material must be cooled in a reducing atmosphere. The ratio of tungstic oxide to carbon required varies from 10:1 to 10:1.6 according to the process used, the temperature of reduction, and the time. Part of the

excess of carbon may be removed by washing the product. Reduction with wood charcoal in an iron tube in which the charge was kept in position by means of fireclay plugs yielded a product containing 98% tungsten, 0.3% carbon, and 0.8% silica. Since iron tubes are considerably oxidised at the reduction temperature (1100° to 1120° C.) it is advisable to use tubes of alundum or fireclay. Reduction with lampblack in fireclay crucibles gave a product containing 0.4% of carbon, which was reduced by washing to 0.1%. To prevent incomplete reduction of part of the material a continuous process was devised, in which the mixture of tungstic oxide and carbon was introduced into the upper end of a tube 3 ft. long and 1 in. diam., which was set at a slant in a furnace so that a portion of 9 in. was kept at about 1080° C. From time to time the material was poked through the tube, so that it was kept in the hot portion for about 30 mins., whilst the reduced portion was forced forward into the lower part of the tube, which was cooled with water. The final product contained 95.2% tungsten and 4.4% carbon, and, after washing with water, contained 98.5% tungsten. In experiments in which tungstic oxide was reduced by means of hydrogen, brown oxides were formed at 800° to 1000° C., whilst after 1½ hours at 1080° C. a product containing 99.4% of tungsten was obtained. Reduction with gasoline vapour for 2 hours at 1080° C. yielded a product containing 98% tungsten.—C. A. M.

Metals and alloys; Effect of work on —. O. W. Ellis. Inst. of Metals, Mar., 1919. [Advance copy.] 15 pages.

The existence of inversion points on the graphs connecting the percentage reduction of a metal by cold work and the corresponding tensile strength is shown for steel, copper, 70:30 brass, 60:40 brass, and 80:20 cupro-nickel. An explanation of this general phenomenon on the following lines is put forward. There exists a tendency at all temperatures for a cold-worked metal to recrystallise. For a certain amount of work this tendency to recrystallise becomes appreciably greater, and at this stage the effect of further cold work is lessened and a discontinuity in the curve is shown. The curve relating the amount of cold work with the work required to drive the rolling mill to produce further reduction also shows a change corresponding to that in the tenacity-reduction curve.—F. C. Th.

Flotation of oxidised lead ores. G. L. Allen. Chem. and Met. Eng., 1919, 20, 169—175.

The recovery of slime values, consisting principally of lead carbonate with some sulphide, is difficult in ordinary milling practice and a serious loss of lead and of silver often occurs. As the concentration of sulphide minerals has been successfully carried out by flotation processes, the author discusses the adaptation of this process by "sulphidising" the oxidised minerals with subsequent separation by flotation. The carbonates are treated with a soluble sulphide to convert them, at least superficially, into sulphides. This may be carried out as a wet reaction in the grinding mill, by the addition of a solution of hydrogen sulphide or sodium sulphide. The latter possesses a disadvantage in that the hydrolysis of Na_2S is almost complete and the formation of a strongly alkaline solution is detrimental to flotation. Sodium sulphide, however, is less active than hydrogen sulphide, and does not readily convert iron compounds, especially limonite, into the sulphide, and so a purer concentrate is usually obtained with this reagent. Cerussite, wulfenite, and cerargyrite (horn-silver) are easily converted into sulphide, but minium, anglesite, pyromorphite, vanadinite, and descloizite are less readily attacked and a poor recovery of the latter minerals is

effected. Pyrolusite and other manganese compounds, basic sulphate of iron, and lead peroxide interfere by reason of their oxidising effect on the sodium sulphide, and ferrous salts are undesirable owing to the consumption of the necessary sulphide to precipitate ferrous sulphide. It is calculated that only 6.9% of the theoretical quantity of sodium sulphide suffices to induce the flotation of a favourable ore.—C. A. K.

Sulphuric acid from galena. Goldmann. See VII.

Action of slag on refractories. Howe. See VIII.

Electrical synthesis of colloids. Svedberg. See XI.

PATENTS.

Iron alloys; Process of making —. J. R. Speer, Trappe, Md. U.S. Pat. 1,291,220, 14.1.19. Appl., 3.5.15.

An alloy "highly responsive to heat treatment" is made by melting together equal parts of charcoal iron and low-carbon steel with the addition of 0.50–2.0% of chromium and 0.25–1.0% of nickel. The molten metal is then cast.—C. A. K.

Manganese-steel; Method of making —. *Process of recovering manganese-steel.* W. G. Nichols, Chicago Heights, Assignor to American Manganese Steel Co., Chicago, Ill. U.S. Pats. (A) 1,291,655 and (B) 1,291,656, 14.1.19. Appl., 2.3.17 and 31.5.17.

(A) Molten metal is blown, the slag separated, and the metal weighed at about 1650° C. Manganese steel alloy at a temperature of about 1330° C. is added to raise the manganese content to 11–14%, and the mixed metal is poured. (B) Manganese steel is heated at an initial temperature below the oxidising temperature of manganese, and at successively increasing stages until the melting point of manganese steel is reached. When required for pouring, the necessary amount of manganese is added and the metal raised to a proper pouring temperature.—C. A. K.

Iron and steel; Solution for rust-proofing articles of —. W. H. Allen, Assignor to Parker Rust Proof Co. of America, Detroit, Mich. U.S. Pat. 1,291,352, 14.1.19. Appl., 11.1.17.

An aqueous solution of phosphoric acid, manganese dioxide, and zinc.—T. St.

Metal; Process for cleaning —. H. E. Finlay, Detroit, and F. L. Fangboner, Royal Oak, Assignors to Burroughs Adding Machine Co., Detroit, Mich. U.S. Pat. 1,290,952, 14.1.19. Appl., 8.6.17.

Metal articles are cleaned and protected from rust by pickling them in a hot solution of hydrochloric and nitric acids, then subjecting them to a cold solution of cyanide, washing, and finally immersing in oil heated to above 100° C.—T. St.

Copper sweepings and scraps; Process for treating —. C. C. Clito, Brussels. Eng. Pat. 123,418, 28.2.18. (Appl. 3591/18.)

Copper sweepings from foundries and smelting works may contain Cu 5 to 10, SiO₂ 60 to 75, organic matter 5 to 10%, and small percentages of zinc, iron, tin, and antimony. To obtain the copper, the sweepings are roasted with crude common salt whereby either cupric chloride or cuprous chloride is formed, according to the temperature. The latter compound is volatile, and, if formed, is recovered in condensing apparatus. When cupric chloride is

formed, the roasted mass is extracted with dilute sulphuric acid, the residue treated in a filter-press, and the copper precipitated from the liquor by scrap iron.—T. St.

Crucible furnace for melting metals. T. W. Aitken, Luton. Eng. Pat. 123,437, 3.5.18. (Appl. 7474/18.)

A barrel-shaped crucible is supported horizontally in a furnace body on a longitudinal wall, which divides the chamber between the crucible and the furnace bottom into two flues. At the front end of the crucible the two flues turn upwards and communicate with a return flue on the upper side of the crucible. Each of the lower flues is provided with a high-pressure jet and the flames travel parallel with the crucible wall, thus reducing erosion. The upper portion of the furnace is constructed in two parts to facilitate replacement of the crucible, and the whole furnace is mounted, for tilting, on trunnions.—C. A. K.

Spongy lead; Production of —. V. G. Yourieff, Chingford, Essex. Eng. Pat. 123,587, 27.2.18. (Appl. 3505/18.)

A current is passed between a lead anode (e.g., old accumulator plates) and a cathode of another material (e.g., zinc), with a 20% solution of potassium or sodium hydroxide as electrolyte. The lead does not deposit on the cathode but is carried to the surface of the liquid by hydrogen bubbles, and may be collected at intervals as a spongy mass, which is neutralised and washed. A current density of about 12 amps. per sq. foot of anode surface is suitable.—C. A. K.

Castings; Composition for mending fissures in —. W. F. Singer, Assignor to A. V. Fagerstrom, F. Clasby, and J. E. Fairbanks, Pueblo, Colo. U.S. Pat. 1,291,207, 14.1.19. Appl., 8.6.18.

A mixture of 40 parts of graphite with 60 parts of molten sulphur.—T. St.

Alloy. L. W. Chubb, Edgewood Park, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,291,408, 14.1.19. Appl., 2.1.15.

An alloy consisting of Fe 93 to 99, and Ni 7 to 1%, is suitable as a magnetisable member for use with inductions of 16,000 gauss and over.—T. St.

Zinc furnace; Vertical —. F. Fiechtl, Cherryvale, Kans. U.S. Pat. 1,291,643, 14.1.19. Appl., 2.11.17.

A zinc smelting furnace consists of a battery of vertical retorts with a movable charging car above. The charging car is fitted with at least one plunger for controlling the volume of material fed from the hopper.—C. A. K.

Aerating liquid [ore pulp]; Process for —. F. B. Kollberg, Bisbee, Ariz., and M. Kraut, Los Angeles, Cal., Assignors to Southwestern Engineering Co. U.S. Pat. 1,261,556, 2.4.18. Appl., 8.11.16.

A drum with longitudinal riffles on its outer surface rotates in a chamber to which a mixture of ore pulp and oil is supplied. A curved plate extends around and close to part of the periphery of the drum. A thin layer of ore pulp is carried round by the drum and is aerated by air introduced into the drum and discharged through slots between the riffles. The air is held in the pockets between the riffles, and the pulp is drawn as a film over the air pockets whereby bubbles are formed. The aerated pulp is discharged from the drum into an adjoining chamber.—C. A. K.

Furnace for heat treatment. A. Smallwood, London. U.S. Pat. 1,290,384, 7.1.19. Appl. 19.9.16. SEE Eng. Pats. 102,242 and 102,243; this J., 1917, 36.

Pyrites furnaces. Eng. Pat. 118,094. See VII.

Electrical etching. U.S. Pat. 1,291,310. See XI.

XI.—ELECTRO-CHEMISTRY.

Colloids; Electrical synthesis of —. T. Svedberg. Kolloid-Zeits., 1919, 24, 1—7.

Metal sols may be produced: (1) by passing a current of 10 amps. and 440 volts across a strip of gold or silver foil attached to a sheet of glass and immersed in alcohol, (2) by passing a similar current through thin strips or wires of platinum, copper, lead, zinc, or aluminium, stretched between two stout iron wires and immersed in alcohol. (See also J. Chem. Soc., May, 1919.)—J. F. S.

Reactions; Modality of — and chemical dynamics; application to the phenomena of electrolysis and spectroscopy. J. Meunier. Bull. Soc. Chim., 1919, 25, 49—68.

A THEORETICAL PAPER. (See J. Chem. Soc., 1919, ii, 132.)—W. G.

PATENTS.

Electrical etching; Electrolytes for —. J. H. Weeks, Rutledge, Assignor to J. S. Weeks, Delaware, and R. M. Weeks, Philadelphia, Pa. U.S. Pat. 1,291,310, 14.1.19. Appl., 4.4.17.

The surface to be etched is carried by the anode, the electrolytic bath being composed of an acidified solution in water of one or more of the chlorides of aluminium, ammonium, barium, cadmium, calcium, chromium, cobalt, copper, iron, lithium, magnesium, manganese, nickel, potassium, strontium, sodium, tin, zinc.—J. S. G. T.

Reaction in gases at high temperatures; Process for producing — and apparatus for practising the same. L. L. Summers, Chicago, Ill. U.S. Pat. 1,291,660, 14.1.19. Appl., 31.7.13.

A RELATIVELY inert gas is passed through the arc of an electric furnace until it is highly heated, and a material (in liquid form) to be combined with the gas is then injected together with a cooling liquid, which extinguishes the arc. Products of the reaction are immediately withdrawn and cooled.

—O. A. K.

Spongy lead. Eng. Pat. 123,587. See X.

Electrical apparatus for subjecting articles to varying temperatures. Eng. Pat. 123,545. See VIII.

XII.—FATS; OILS; WAXES.

Naphthenic acids. Kolbe. See IIa.

Action of lipase on fatcice. Dubosc. See XIV.

PATENTS.

Hydrogenising oils and fats; Apparatus for —. H. Lane, Ashford, Middlesex. Eng. Pat. 123,966, 31.12.18. (Appl. 21.895/18.)

In the apparatus described in Eng. Pat. 968 of 1915 (this J., 1916, 642) instead of using an exterior pipe for the circulation of the mixture of catalyst and

oil, an inner vessel open at both ends is placed within the outer vessel. The agitator is within the inner vessel, and the mixture is withdrawn by a centrifugal pump at the lower end of the inner vessel and forced upwards into the annular space between the vessels, whence it overflows into the inner vessel.—A. de W.

Soluble substances [grease]; Apparatus for extracting — [by volatile solvents]. W. E. Garrigues, New Orleans, La., Assignor to W. Garrigue and Co., Inc., New York. U.S. Pat. 1,282,407, 22.10.18. Appl., 3.10.17.

A HORIZONTAL rotating drum is provided with longitudinal perforated pipes arranged around its inner periphery and bent radially at one end where they terminate in a central hub attached to the drum. Solvent is introduced into the drum through a central valve at this end, and is discharged at the opposite end through a filter. When extraction is complete a hot gas (steam) is introduced through the hub to expel the residual solvent. The hub rotates on a fixed distributing member connected with a steam-supply pipe and constructed in such a way that steam is admitted to those pipes which are momentarily at the bottom of the drum, and cut off from those which are at the upper part of the drum. Steam is also passed through closed pipes within the drum in order to prevent condensation of water.—W. F. F.

Detergent soaps and means for and method of making the same. G. W. Douglass, Spondon. Eng. Pat. 123,835, 9.3.18. (Appl. 4160/18.)

A DETERGENT soap is prepared by dissolving a base soap (19—24%), with or without the addition of sodium silicate (up to 10%), in boiling water (20—25%), adding sodium carbonate (30%) and sodium bicarbonate (15%) and mixing thoroughly. A detergent spirit such as naphtha, benzol, carbon tetrachloride, or the like or a mixture of the same is then added in the proportion of 6%. The spirit may be added at the same time as the sodium salts.—A. de W.

Wool-fat and other similar substances; Process of producing high-melting fatty acids and hydrophilous neutral products from —. I. Lifschütz, Hamburg, Germany. U.S. Pat. 1,284,723, 12.11.18. Appl., 12.1.17.

SEE Ger. Pat. 286,244 of 1913; this J., 1915, 1153.

Extracting apparatus for oils, etc. Eng. Pat. 123,645. See I.

Drying oils from fatty acids. Eng. Pat. 123,792. See XIII.

Oleic acid isobutyl ester. Eng. Pat. 123,685. See XX.

Cetyl alcohol. U.S. Pat. 1,290,870. See XX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Pigments; Standardisation of colour as related to —. J. Lawrance. Oil and Colour Chem. Assoc., 1919, 2, No. 6.

COLOUR measurements may be recorded on a "colour solid," where colours are plotted to a minimum of determinable values, viz., "tone value," "purity value," and "hue value." The

colour solid takes the form of a graph with three axes at right angles to one another. Tone value, the position of a specified colour relative to black and white, or the amount reflected by its surface, is plotted in percentages on the vertical axis from pure black to pure white. Purity values are measured in distances at right angles to the vertical axis and determine in a colour the amount of admixture with a neutral grey of an intensity proportionate with its position in height on the vertical tone value axis. Colour circles bearing the primary colours on their circumferences at equal distances from one another are disposed about the vertical tone value axis and serve for measurement of purity values in angular measure clockwise from a primary colour. Thus, theoretically pure colours having equal tone and purity values would lie on the circumference of a circle of such diameter as to indicate no admixture with grey and at a height on the axis represented by 100% white. Any given colour can be matched by Maxwell's method of using interlocking discs of the standards chosen as primary colours, and black and white, and the position on the colour solid may be found from the results obtained. It being impossible to find standards of pure primary colours of equal visual intensity (tone value), the brighter colours, *e.g.*, lemon chrome etc., need to be toned down by neutral greys until they lie in the same horizontal plane as a grey consisting of 30% white and 70% black in order to be equivalent to the more sombre colours, such standards being then designated as of 30% tone value. The geometrical properties of the colour solid may be plotted as a polygon of colour forces and the resultant plotted. It has been found that apparent change in colour by visual inspection is not quantitatively identical with actual changes as measured by discs. Changes in hue value accompany reductions in the tone values of certain pigments by admixture although fairly good agreements were obtained from black and white in one case and yellow ochre in another. In the case of ultramarine blue and middle chrome, violets are obtained by admixture by discs, whilst greens are obtained by mixture of pigments.—A. de W.

Varnish analysis; Methods of — W. T. Pearce. J. Ind. Eng. Chem., 1919, 11, 200–201.

VARNISHES of widely differing composition were prepared from weighed quantities of resins, colophony, oils, driers, and turpentine, and used to determine the degree of accuracy of different methods of analysis. In heating the resins in preparing the varnishes the loss in weight was between 20 and 30%, except when only resin was used, when it was 7%, whilst the loss in weight of the oils was from 1 to 2%. The results obtained by McIlhenny's method of determining rosin (this J., 1908, 806) agreed closely with the theoretical amounts, whilst for the separation of resins and oils Boughton's method (Techn. Paper 65, U.S. Bureau of Standards) gave results accurate within about 1%. —C. A. M.

PATENTS.

Chrome yellows; Manufacture of — E. F. Morris, Liverpool. Eng. Pat. 123,841, 12.3.18. (Appl. 4230/18.)

A LEMON chrome of greater staining power for a given lead chromate content is obtained by the use of a basic lead acetate solution which has been subjected to a preliminary treatment with chalk or other purifying agent which will absorb lead oxide, the clear supernatant liquor being used. —A. de W.

Matter in a finely-divided state [pigments etc.]; Art of producing — J. Alexander, Assignor to National Gum and Mica Co., New York. U.S. Pat. 1,259,708, 19.3.18. Appl., 1.5.14.

SEPARATE solutions containing the various components of the compound to be prepared are treated with suitable protecting colloids and then mixed or otherwise caused to react. A much greater degree of subdivision is obtained by adding a protecting colloid to each of the components from which a precipitate is to be produced than when a protecting colloid is added only to one of the components. The process is applicable to the preparation of pigments, catalysts, etc. Examples are given of the preparation of the barium lake of Orange II, gum arabic being added both to the dye solution and to the barium chloride used as precipitant; and of lithopone by the interaction of barium sulphide and zinc sulphate, gelatin being added to both components.—W. E. F. P.

Linoleum and linoleum cement. A. B. Craven, Selby, and The Yorkshire Dyeware and Chemical Co. Ltd., Leeds. Eng. Pat. 123,791, 28.1.18. (Appl. 1600/18.)

THE fatty acids of drying oils and/or semi-drying oils or the glycerides of semi-drying oils (excluding tung, linseed, and soya bean oils), mixtures of the same, or the products from their refinement are converted into resilient, tacky, and adhesive products suitable for use as linoleum cements, by subjecting them, in the presence of a drier, to oxidation with gaseous oxygen or ozonised oxygen at a temperature not exceeding 110° C. The solidity of the resulting product is adjusted by varying the relative proportions of unsaturated and saturated acids and/or their glycerides by preliminary filtration and distillation to remove non-drying matter. The products may be incorporated with gum resins, rosin, aluminium hydroxide, etc.—A. de W.

Drying oils from fatty acids of linseed oil, other drying oils or semi-drying oils; Manufacture of — F. Boehm Ltd., and C. A. Reihl, London. Eng. Pat. 123,732. (Appls. 1856, 1.2.18, and 2618, 13.2.18.)

A WELL-DRYING oil suitable for use as a linoleum oil, for waterproofing oil-cloth and floorcloth, or in the manufacture of paints, is obtained by heating fatty acids from drying or semi-drying oils to a temperature 20°–30° C. below their boiling-point in the presence of 0.25–0.5% of metallic copper, nickel, or cobalt whilst blowing in oxygen until the resulting product has attained a sp. gr. of 0.992–0.998. An addition of 12–15% of China wood (tung) oil together with a small percentage of an alkaline-earth soap greatly increases the speed of polymerisation. —A. de W.

Resins; Manufacture of — [from solvent naphtha]. F. W. Sperr, jun., Oakmont, Pa., and M. Darrin, Wilkensburg, Pa., U.S.A. Eng. Pat. 123,806, 1.3.18. (Appl. 3664/18.)

SEE U.S. Pat. 1,263,813 of 1918; this J., 1918, 433 A. Strips of copper, silver, gold, or platinum, to act as catalysts, may be immersed in the liquid when it is being heated under pressure or when it is being distilled.

Proteids [for varnish, lacquers, celluloid-substitutes, etc.]; Process of recovering — from vegetable proteid-containing material. S. Satow, Sendai, Japan. Eng. Pat. 121,141, 28.6.17. (Appl. 9291/17.)

SEE U.S. Pat. 1,275,308 of 1918; this J., 1918, 669 A. The protein extract is purified by treatment in a

high-speed centrifugal separator, and filtration, and then, if a clear transparent solution is not obtained, is fractionally precipitated with an acid, *e.g.*, sulphuric or sulphurous acid, and the remaining liquid decanted and filtered until it is clear. Alternatively, the proteins may be precipitated from the extract together with the colloidal and suspended impurities, by addition of a limited quantity of sulphuric or acetic acid, and the precipitate treated with a weak solution of sulphurous or hydrochloric or other acid to dissolve the proteins. The purified proteins after the final separation are dried in a vacuum.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Devulcanisation of — by hexamethylene-tetramine under pressure. A. Dubosc. Caoutchouc et Gutta-Percha, 1919, 16, 9721—9722.

A SAMPLE of vulcanised rubber, after successive extraction with acetone, cold chloroform, hot chloroform, alcoholic potassium hydroxide, and water, was swollen with carbon tetrachloride and finely divided; the dry powder was then heated with a saturated aqueous solution of hexamethylene-tetramine in a sealed tube by steam at 7 atmospheres pressure for 24 hours; the sulphur content was thus reduced from 2.179% to 0.367%. In similar experiments with steam pressures of 6 and 4 atmospheres respectively the final sulphur content was 0.432 and 0.742%; with a pressure of eight atmospheres the rubber undergoes considerable decomposition.—D. F. T.

Devulcanisation of rubber by catalysts. A. Dubosc. Caoutchouc et Gutta-Percha, 1919, 16, 9722.

THE effect of catalysts in vulcanisation is reversible and such compounds not only expedite the combination of sulphur with rubber but should also be able to aid the liberation of combined sulphur from vulcanised rubber. A boiling alcoholic solution of hexamethylenetetramine was found to reduce the combined sulphur in a sample of rubber from 2.067% to 1.195% (compare Spence, this J., 1917, 1050). Probably on account of the lower solvent power of water for sulphur and its feeble penetrative action on rubber, aqueous solutions of hexamethylenetetramine are less effective under similar conditions.—D. F. T.

Factice; Action of lipase on white —. A. Dubosc. Caoutchouc et Gutta-Percha, 1919, 16, 9722—9727.

A WHITE factice of good appearance showed a tendency to become brown and sticky, the change being accompanied by the liberation of so much heat that the material on one occasion inflamed. Examination of the decomposed material revealed the presence of an increased percentage of acetone-soluble constituents and a marked diminution in the proportion of combined oils insoluble in acetone; glycerol was found in the aqueous extract of the damaged substitute. The alteration in the factice was therefore probably due to the presence of a lipase; a similar effect was produced in stable factice by moistening with a lipolytic extract prepared from castor oil seeds.—D. F. T.

PATENT.

Extracting apparatus for rubber. Eng. Pat. 123,645. See I.

XV.—LEATHER; HORN; BONE; GLUE.

Tannin compounds; Colloidal — and their applications. C. F. Cross, C. V. Greenwood, and M. C. Lamb. J. Soc. Dyers and Col., 1919, 35, 62.

THE authors deal with the application of the principle of restrained tannage, whereby skins may be completely tanned in a single treatment by a strong tanning liquor, which is prevented from forming a hard impervious layer, by the influence of a colloid which itself has an affinity for the tannin but parts with it to the hide substance. The colloid employed as a restraining agent is gum-tragacanth, which in the form of a 3% solution is a fairly stiff jelly. The variations of viscosity of dilute solutions of the gum with temperature, concentration, and time of keeping have been studied. The viscosity increases very rapidly as the concentration is increased above 0.5%; it falls on keeping the solutions, apparently as the result of the activity of organisms. The gum, being a true hemicellulose, a manno-galactan, gives a precipitate with Fehling's solution in the cold and the condition of any sample of gum may be determined by estimating the amount of cupric oxide removed from Fehling's solution by this precipitate and the cuprous oxide formed by the hydrolysed products on boiling the filtrate. Although a hemicellulose, the gum gives solid films of great tenacity, comparable with those of colloid cellulose; tensile tests showed breaking lengths of 5300 to 8870m., and elongations of 5 to 7%. In practice, the proportions used are such as are represented by equal parts of a quebracho extract containing 25–29% of tannins and the commercial 3% tragacanth jelly, both suitably diluted. The prepared hides may be steeped in this mixture and tannin added to replace that absorbed. The tannin strikes through in a remarkably short time as compared with that occupied in complete tanning with the plain extract. Alternatively, the treatment may be effected in the drum or Wilson tanning machine, using about 30% of tragacanth calculated on the weight of the goods. Another way is to "drum" the hides in the strong tragacanth jelly for 2–3 hours until they have become thoroughly impregnated with the colloid and then treat them with the strong tanning extract. By this method the reaction between the tragacanth and the tannin takes place inside the goods. The interstices of the leather are filled with the tragacanth-tannin compound and the product has a smoother, better filled texture than that tanned in the ordinary way; it is also less pervious to water and, the tannin being more protected from the action of the air, the colour is lighter than that of ordinary leather. The employment of the colloid has also proved advantageous in tanning with basic chromium sulphate, particularly in maintaining the plump and swollen condition of the fibres during the penetration of the chromium salt and in filling up the interstices, giving a superior finish and resistance to moisture. The composition of the tragacanth-tannin compound corresponds to $2C_6H_{10}O_5$ to $1C_{14}H_{10}O_9$, but when the reagents are mixed in these proportions, precipitation is not complete; on increasing the tannic acid to 2 mols. the characteristic coherent coagulum is obtained. Further increase in the proportion of tannic acid is disadvantageous and lowers the viscosity.—J. F. B.

Sal bark (Shorea robusta). Cross and Bevan. See V.

Titanium compounds. Barnes. See VI.

PATENT.

Fish scales; Method for treating —. [Material resembling celluloid]. S. Sakane, Kyoto, Japan. U.S. Pat. 1,264,979, 7.5.18. Appl., 27.6.17.

A TRANSPARENT substance resembling celluloid is prepared by treating fish scales with an alkali (sodium carbonate) which removes all fatty matters and destroys the odour, and then treating the residue with an acid (dilute hydrochloric acid) to dissolve all the lime salts but leave the lines of growth unattacked and conspicuous. The product is steeped in a condensing agent (formaldehyde, aluminium sulphate, tannin, or the like) and then in a softening agent (glycerin solution).—J. F. B.

XVI.—SOILS; FERTILISERS.

Nitrates; Determination of — in soil by the phenoldisulphonic acid method. H. A. Noyes. J. Ind. Eng. Chem., 1919, 11, 213–218.

NITRATES are completely extracted from soil by extraction with cold water, and the presence of chlorides does not interfere with their accurate determination by the phenoldisulphonic acid method provided that the temperature is kept below that at which chlorides and nitrates react with the sulphuric acid. 50 grms. of soil is shaken for 1 min. in a stoppered bottle, with 200 c.c. of water, and the shaking twice repeated at intervals of 30 mins. The extract is then filtered, and as soon as 50 c.c. of clear filtrate has been obtained 5 c.c. is transferred to a 2½ in. porcelain evaporating dish, and evaporated to dryness on the water-bath. At the same time 5 c.c. of potassium nitrate solution containing 0.0001 grm. of nitrate per c.c. is evaporated in a similar dish as a standard for comparison. When the dishes are cold 1 c.c. of phenoldisulphonic acid prepared as described by Chamot, Pratt and Redfield (this J., 1911, 442) is added drop by drop to each dish so as to form a ring round the residue. Each dish is rotated so that the whole of the residue is moistened, and after 15 mins. 15 c.c. of cold water is slowly added. Ammonium hydroxide solution (4 to 8%) is then sprayed from a wash-bottle into the liquid until a permanent yellow coloration is obtained, after which the solutions are transferred to a Schreiner colorimeter and the colours matched. If the soil gives a coloured extract or contains iron, 5 grms. of calcium hydroxide is added to it prior to the addition of the water. In the case of soils containing less than 100 parts of nitrates per million 20 c.c. of the extract is taken for the colorimetric comparison.—C. A. M.

Rock phosphate; Solvent action of dilute citric and nitric acids on —. J. A. Stenius. J. Ind. Eng. Chem., 1919, 11, 224–227.

PORTIONS of 3 grms. each of rock phosphate were extracted with 100 c.c. of dilute citric acid (0.5 to 0.1%) by shaking them in a machine for 30 mins. The liquid was then diluted to 500 c.c. and filtered, and the phosphorus determined in the filtrate. It was found that extraction with 0.2% citric acid gave a result for available phosphoric acid approximately equal to that obtained by using neutral ammonium citrate. Extraction with 0.5% citric acid removed more than twice as much phosphorus. Variations in the quantity of rock phosphate treated had also a pronounced influence on the amount of phosphoric acid extracted. For example, when 0.1 grm. was used instead of 3 grms. the amount of phosphorus extracted by 0.2% citric acid was 4.28%, as against 0.1918%. The presence of basic substances such as calcium carbonate reduces the solvent action of citric acid and this influence is

not entirely eliminated by adding an extra amount of citric acid equivalent to the basic substance, as stated by Cousins and Hammond (Analyst, 1903, 238). In similar extractions with dilute nitric acid (0.06 to 0.015%) still larger amounts of phosphorus (11.91 to 8.13%) were removed, so that it is no more suitable than citric acid for determining the available phosphorus in rock phosphates. In the case of nitric acid, however, the effect of basic substances can be neutralised by adding the additional amount of acid equivalent to the bases. Neutral ammonium citrate solution does not extract the true amount of available phosphorus, but is probably as trustworthy as any solvent can be, whilst it affords an indication of the effect of treatment in rendering the phosphorus in rock phosphates available. It is essential, however, that two determinations should be made under uniform conditions before and after the treatment.—C. A. M.

Basic slag; Solubility of — in organic acids. M. Sirot and G. Joret. Ann. Chim. Analyt., 1919, 4, 80–85.

THE authors have determined the solubility of the different constituents of basic slag in various organic acid solutions. In each case a 2% acid solution was employed and the determination was made after the sample had been shaken with the solution for 30 mins. To a certain extent, the solubility depended on the fineness of the slag and the figures given below were obtained with a sample of which 86.4% passed a 100-mesh sieve; the figures express percentages of the total amount of constituent present.

—	Total	Soluble in					
		Citric acid	Malic acid	Tar-taric acid	Lac-tic acid	Acet-ic acid	Oxal-ic acid
Phosphoric acid	18.5	82.5	84.8	54.4	99.7	50.4	26.7
Lime ..	51.4	76.6	83.6	46.1	88.7	68.6	0.0
Silica ..	6.5	99.2	95.3	57.3	100.0	88.3	30.7
Iron ..	19.3	34.7	31.3	11.9	25.5	15.3	23.3
Manganese ..	4.0	27.5	25.0	15.5	22.5	14.5	13.5
Magnesia ..	3.0	21.0	31.3	5.0	25.0	19.0	Trace
Sulphur ..	0.48	43.7	47.9	—	—	33.3	—

The solubility of the sulphur was determined in a separate sample of the slag.—W. P. S.

Hops; Effect of fertilisers on the composition of —. G. A. Russell. J. Ind. Eng. Chem., 1919, 11, 218–224.

FIELD tests were carried out during three successive years on an upland and a sandy loam soil, the effect of irrigation being also studied. The total amount of available soft resins showed a large increase on the irrigated fertilised soil, but this was due to the increased growth of the hops, the percentage of resins in the hops being decreased. The results do not indicate any marked superiority of a particular fertiliser or combination of fertilisers in regard to the yield of available soft resins per acre. The amount of soluble ash was not greatly affected by the use of fertilisers or irrigation.—C. A. M.

Effect of superphosphate on indigo plant. Davis. See IV.

Phosphorus in basic slag. Travers. See X.

PATENT.

Phosphate fertiliser containing nitrogen; Method of manufacturing —. A. Foss, Assignor to Norsk Hydro-Elektrisk Kvælstofaktieselskab, Christiania, Norway. U.S. Pat. 1,292,293, 21.1.19. Appl. 8.5.17.

See Eng. Pat. 114,873 of 1917; this J., 1918, 315 A.

XVII.—SUGARS; STARCHES; GUMS.

PATENTS.

Sugar; Method and apparatus for treating [centrifuging] — J. E. Drury and R. C. Folsom, Boston, Mass., Assignors to American Sugar Refining Co. U.S. Pat. 1,270,796, 2.7.18. Appl., 28.12.17.

AFTER the separation of syrup from moistened raw sugar by centrifuging, an outlet in the bottom of the centrifugal basket is opened, and a jet of water under high pressure is directed against the walls of the basket to detach the layer of sugar, which, with the water, discharges by gravity through the outlet into a melting pot below.—J. H. L.

Sugar juices; Method of treating raw — A. Kraft, Honolulu, Hawaii. U.S. Pat. 1,271,914, 9.7.18. Appl., 7.3.17. Renewed 1.12.17.

Raw sugar juice after liming is brought into direct contact with hot products of combustion from a boiler furnace or other source of heat; e.g., boiler flue gases are passed upwards through a chamber in which the juice from the liming tank descends in the form of a shower. By using hot flue-gases the employment of juice heaters is rendered unnecessary. Moreover, the suspended solid matter in the flue-gases exerts a decolorising action on the juice.—J. H. L.

Sugar manufacture. L. Naudet, Chelles, France. U.S. Pat. 1,286,066, 26.11.18. Appl., 5.3.14.

SEE Fr. Pat. 466,590 of 1913; this J., 1914, 878.

XVIII.—FERMENTATION INDUSTRIES.

Alcohol; Production of — from marine algæ. E. Kayser, Ann. Chim. Analyt., 1919, 4, 79—80. (See this J., 1918, 524A.)

Laminaria flexicaulis and *L. saccharina* when dried, cut into small pieces, and heated with water under pressure give a liquid which can be fermented; the yield of alcohol is from 3.58 to 3.76 litres per 100 kilos. of the dry algæ. If 7% sulphuric acid is used instead of water and the liquid brought to an acidity of 0.1% before fermentation, the yield of alcohol is increased to 12 litres.—W. P. S.

Bacterial emulsions; Some optical properties of — F. Viès. Comptes rend., 1919, 169, 575—578.

THE loss which a ray of light undergoes when traversing a bacterial emulsion depends on phenomena connected with the optical properties of the inter-bacterial liquid as well as on phenomena dependent on the bacteria themselves. Using rays of wave length $\lambda =$ about 620, in which region the inter-bacterial liquid has a minimum absorption, it was found that the transmission was almost directly related to the amount of substance in the liquid. Thus $1/I_1 = e p^1 + f$, where p is the dry weight of bacteria per c.c. of emulsion, e and f being constants dependent on certain experimental conditions and possibly on the kind of bacteria used. A second relation may be expressed by $1/I_1 = (A n^{-1} + B)(C r^{-1} + D)$, where n is the number of bacteria per c.c. and r is the mean volume of the bacteria.—W. G.

Effect of fertilisers on hops. Russell. See XVI.

PATENTS.

Vinegar and acetic acid; Apparatus for the concentration of — E. Klein, Peekskill, N.Y., Assignor to The Fleischmann Co., Cincinnati, Ohio. U.S. Pat. 1,291,025, 14.1.19. Appl., 24.5.16.

THE apparatus comprises a chamber provided with a feed pipe and an outlet pipe; the former enters below a perforated partition in the chamber and the outlet pipe is connected with a condenser. A pipe connects the feed and outlet pipes and is also connected with the condenser; a valve is provided for causing the flow from the outlet pipe to pass to the condenser or to the feed pipe. A number of these chambers may be arranged in series.

—W. P. S.

Rectifying process and apparatus. E. A. Barbet, Assignor to E. Barbet et Fils et Cie., Paris. U.S. Pat. 1,292,670, 28.1.19. Appl., 6.3.14.

SEE Fr. Pat. 470,242 of 1913; this J., 1915, 194.

Treating potatoes. Eng. Pat. 123,591. See XIXA.

XIXA.—FOODS.

Milk; Coagulation of — and the physical condition of milk curd. O. Allemann. Kolloid-Zeits., 1919, 24, 27—42.

THE solidity of rennet curd is directly proportional to the time which has elapsed since coagulation, and to the acidity of the mixture, and inversely proportional to the time taken in coagulation. The solidity of the curd is increased by the addition of potassium chloride in proportion to the amount added. The solidity increases with increasing temperature up to a maximum, but above 41°—42° C. it decreases rapidly. The solidification of the curd is a continuation of the coagulation and takes place according to the ordinary coagulation laws. The solidity is dependent on the individuality of the animal which has supplied the milk and is constant over long periods of time. Sudden changes in the solidity may occur, due to weather conditions and to physiological conditions, and after a short time disappear.—J. F. S.

PATENTS.

Flour or meal and milling products; Process and apparatus for increasing the yield of bread and improving the baking qualities of — E. C. Sutherland, Deventer, Holland. Eng. Pat. 115,410, 7.9.17. (Appl. 12,861/17.) Int. Conv., 28.4.17.

THE flour is heated at 40° to 60° C., and then cooled at -5° to -10° C. The heating and cooling may be repeated, but the maximum and minimum temperatures must be maintained for a short time only.

—W. P. S.

Flour; Treatment of — H. Greville, Birkenhead. Eng. Pat. 123,435, 21.3.18. (Appl. 4983/18.)

THE keeping properties of flour may be improved by the addition of 1 to 4 lb. of sodium chloride per 280 lb. of flour; acid phosphates and other "improvers" may also be added.—W. P. S.

Vegetables and fruits; Process of preserving — A. van Dantzig, Amsterdam, and Naaml. Vennoots. Chem. & Pharm. Laboratorium, Zaandam, Holland. Eng. Pat. 123,403, 21.2.18. (Appl. 3132/18.)

CABBAGE, spinach, salads, gherkins, olives, and the like, are pickled for about 2 days in 3% sodium

chloride solution, then washed, and centrifuged or pressed to remove superfluous moisture. Vegetables thus treated do not require packing in sealed receptacles. Sodium chloride must be added to the pickling solution from time to time to maintain its strength.—W. P. S.

Potatoes; Treatment of — for obtaining food products. H. E. Dowding, Eltham. Eng. Pat. 123,591, 27.2.18. (Appl. 3523/18.)

WASHED potatoes are steamed for 2 hrs. in a converter; water is then added to reduce the temperature to 156° F. (69° C.) and crushed malt is introduced. When the starch has been saccharified, the mixture is filtered, and the filtrate evaporated under reduced pressure to a suitable consistence. If desired, peptase or other enzyme may be added to the filtrate. The resulting syrup may be used in bread-making, whilst the filter-press cake serves as a fodder. When the syrup is intended for use in brewing, the filtrate, before evaporation, may be heated under a pressure dependent on the colour, flavour, and fermentability desired.—W. P. S.

Milk; Manufacture of synthetic —. J. Piperno, New York. U.S. Pat. 1,267,449, 28.5.18. Appl. 7.5.17.

A MIXTURE of fats and organic salts obtained by boiling grated coconut with water, and a mixture of protein, carbohydrates and organic salts extracted from suitable materials, e.g., rice and oatmeal, by boiling with water, are mixed together, and the resulting liquid, while warm, is filtered and treated with a lactic acid culture.—W. P. S.

XIX_B.—WATER PURIFICATION; SANITATION.

Water; Chlorine absorption and chlorination of —. A. Wolman and L. H. Enslow. J. Ind. Eng. Chem., 1919, 11, 209—213.

EXPERIMENTS to determine the velocity of the absorption of available chlorine by the same water during varying intervals of time showed that in general the velocity constant, *K*, decreases with the time, but its value approaches a constant for different time intervals in the case of waters with low organic content. Even in the case of the same water supply changes in colour do not necessarily correspond with variations in the chlorine absorption over a constant interval of time. There is no definite correlation between the degree of turbidity of different waters and their rate of chlorine absorption, but in the case of the same water supply which has been studied under widely varying conditions the turbidity may afford some measure of the chlorine absorption. The amount of chlorine absorbed in a definite interval of time shows some relationship to the amount of oxygen absorbed in the same time, but the chlorine absorption does not increase in direct proportion with the increase in pollution (as measured by the oxygen absorption), but shows a decreasing acceleration. Hence it may be found possible to distinguish between water of good and comparatively poor quality by means of a chlorine absorption test made after 5 mins. There is no general agreement as to the necessary time interval for the test or the relative scale of the safety factor. From experimental data cited it would seem that a 30-minute absorption plus a high factor of safety is hardly required. It is suggested that the addition of a constant factor such as 0.2 to the result obtained in the 5 min. absorption would probably give as trustworthy results in the routine control of chlorination as the use of a longer time interval for the absorption. (See also J. Chem. Soc., May, 1919.)—C. A. M.

Nitrous fumes in mine air; Determination of —. C. Toombs. J. S. Afr. Assoc. Anal. Chem., 1919, 2, 3.

THE sample of air is well shaken with a small quantity of dilute potassium hydroxide solution in which the nitrate and nitrite are then determined colorimetrically by the methods employed in water analysis, e.g., by the phenolsulphonic acid or the Griess-Ilosvay method.—W. E. F. P.

Bacterial emulsions. Vls. See XVIII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Red cinchona bark; Assay of —. W. Partridge. Analyst, 1919, 44, 96.

FOR the determination of total alkaloids in red cinchona bark, the B.P. method consists in mixing 6 grms. of calcium hydroxide with 10 grms. of the powdered bark and 22 c.c. of water, and extracting the paste with "benzolated amyl alcohol." The author obtains better, and higher, results by reducing the quantity of water used to 12 c.c.; in this case the mixture forms a powder which is more readily extracted than is the paste obtained in the official method.—W. P. S.

Hyoscyamus niger. G. P. Koch. Amer. J. Pharm., 1919, 91, 68—82.

THE author has determined that the alkaloid content of green *Hyoscyamus niger* leaves together with the seed pods, collected when most of the seed pods had formed, varied from 0.073 to 0.102%. The roots together with the stems contained 0.081% of mydriatic alkaloids. Dry leaves, collected after harvesting the mature seed, contained 0.057—0.065%. The mydriatic alkaloid in the stems of the dry plants, after harvesting the mature seed, amounted to 0.052—0.057%. It is concluded that it is more advantageous to harvest the plants intended for the preparation of the drug in the green state before maturity of the seeds, in which case the stems can also be utilised in conjunction with the leaves for the preparation of a material containing the quantity of alkaloid specified by the U.S.P. (not less than 0.065%). It was noted, moreover, that even after the plant was dry and the seeds mature, the roots contained an exceptionally high percentage of alkaloid (0.130), which indicates that these portions might be utilised.—J. F. B.

Robinia pseudacacia L.; Toxic constituents in the bark of —. B. Tasaki and U. Tanaka. J. Coll. Agric. Tokyo, 1918, 3, 327—356.

THE fresh bark of the Japanese locust tree, *Robinia pseudacacia*, causes toxic symptoms when eaten by horses, cattle, and other animals. It was found that this was due to a glucoside, "robitin," which was isolated by concentrating an aqueous extract of the bark, clarifying, and precipitating with alcohol. The precipitate obtained, when dried in a vacuum, was a white, hygroscopic, amorphous powder, easily soluble in water and acids, but insoluble in organic solvents. On hydrolysis, it yielded dextrose and rhamnose. The amount obtained from the air-dried bark was 3%. The glucoside contains 2—3% of inorganic matter. On injection into horses and cows, it produced the same symptoms as the fresh bark, namely, rise of temperature, increase of secretions and excretions, and paralysis of hind-quarters. (See also J. Chem. Soc., May, 1919.)—J. H. J.

Acetone. Bassett. See IIa.

Electrical synthesis of colloids. Svedberg. See XI.

Quinosol and "superol." Schoorl. See XXIII.

PATENTS.

β -Bromoethyl-p-nitrobenzoate. The Abbott Laboratories, Chicago, Ill., Assignees of R. Adams and O. Kamm, Urbana, Ill., U.S.A. Eng. Pat. 121,578, 12.4.18. (Appl. 6262/18.) Int. Conv., 21.12.17.

β -BROMOETHYL-p-nitrobenzoate is prepared by heating a salt of *p*-nitrobenzoic acid with an excess of ethylene bromide, preferably in the presence of an amine or of finely divided copper as catalyst. Example:—a mixture of 15 grms. of dry sodium *p*-nitrobenzoate, 75 grms. of ethylene bromide, and 0.5–1.0 c.c. of diethylamine is heated in a sealed tube at about 140° C. for 5 hours. The product is neutralised and distilled with steam in order to remove the excess of ethylene bromide. The residue of β -bromoethyl ester is contaminated with a small quantity of the di-*p*-nitrobenzoic ester of ethylene-glycol from which it may be separated by means of a suitable solvent, such as ether. The yield of crude product is about 15 grms. and after recrystallisation from alcohol the β -bromoethyl ester melts at 51°–52° C. It is utilised for the preparation of diethylaminoethyl *p*-aminobenzoate ("novocaine") by reaction with diethylamine and subsequent reduction.—J. F. B.

Chlorinating the side chains of aromatic hydrocarbons; Process of —. The Selden Co., Pittsburgh, Pa., and H. D. Gibbs, Cherrydale, Va., U.S.A. Eng. Pat. 123,341, 22.10.17. (Appl. 15,320/17.)

SEE U.S. Pat. 1,246,739 of 1917; this J., 1918, 52 A. The process is carried out at a temperature not materially below 150° C. By using a "low pressure" mercury vapour lamp mono- and di-chloro derivatives are almost exclusively produced, e.g., benzyl and benzal chlorides from toluene, whilst by using a "high pressure" lamp, and the theoretical proportion of chlorine, the chief product is the trichloro derivative, e.g. benzotrichloride from toluene.

Isobutyl ester of oleic acid; Process for the manufacture of —. H. R. Napp, London. From E. Preiswerk, Basle, Switzerland. Eng. Pat. 123,685, 18.7.18. (Appl. 11,785/18.)

THE isobutyl ester of oleic acid, a liquid of sp. gr. 0.86 at 20° C., and b.pt. 190° C. at 4 mm. pressure, is insoluble in water but soluble in the usual organic solvents, and possesses valuable therapeutic properties in cases of tuberculous disease. It is prepared by the action of oleic acid chloride on isobutyl alcohol, or of oleic acid on isobutyl alcohol in the presence of hydrochloric acid or zinc chloride, and is purified by distillation under reduced pressure.

—L. A. C.

Benzaldehyde; Method of making —. M. E. Putnam, Assignor to The Dow Chemical Co., Midland, Mich. U.S. Pat. 1,272,522, 16.7.18. Appl., 18.9.16.

BENZYL bromide is mixed with a solution of sodium or calcium or other nitrate and the mixture heated approximately at the boiling point with constant stirring. The benzaldehyde produced is practically pure and is separated from the aqueous layer.

—J. F. B.

Arsenical compounds. W. A. Jacobs, Mount Vernon, W. H. Brown, M. Heidelberger, and L. Pearce, Assignors to The Rockefeller Institute for Medical Research, New York. U.S. Pats. (A) 1,280,119, (B) 1,280,120, (C) 1,280,121, (D) 1,280,122, (E) 1,280,123, (F) 1,280,124, (G) 1,280,125, (H) 1,280,126, and (I) 1,280,127, 24.9.18. Appl., (A) to (E), 3.10.17, (F) and (G) 16.1.18, (H) and (I) 28.1.18.

A SERIES of derivatives of N-phenylglycine-*p*-arsonic acid, prepared by the usual methods, is claimed as powerful agents in the treatment of trypanosomal and spirochætal infections:—(A) The arsonic acid of N-phenylglycinamide or an analogous amide having in its molecule an α -aminoacylamine side chain of the general formula, $\text{NH}.\text{CHR}.\text{CONR}'\text{R}''$, where R is alkyl, aryl, or hydrogen and R' and R'' are alkyl or hydrogen radicals, the aromatic nucleus of the arsonic acid being joined to the α -amino group of the side chain. (B) The arsonic acid of N-phenylglycine- β -methylureide or analogous urea having a side chain of the general formula, $\text{NH}.\text{CHR}.\text{CONHCONR}'\text{H}$, where R and R' are alkyl, aryl, or hydrogen. (C) The arsonic acid of N-phenylglycyl-*m*-aminophenol or analogous anilide, having a side chain of the general formula, $\text{NH}.\text{CHR}.\text{CONHAr}$, where R is alkyl, aryl, or hydrogen and Ar is an aromatic radical which may have substituent groups in its nucleus. (D) The arsinoxides of the amides and anilides specified under (A) and (C). (E) Arsenoaryl derivatives formed by the deoxidation and condensation, e.g. by hypophosphorous and hydriodic acids, of two molecules of the anilides specified under (C), whereby the two molecules are united through their arsenic radicals. (F) Soluble salts of the derivatives specified under (A). (G) Sodium salts, readily soluble in water, of the ureides specified under (B). (H) Soluble salts, e.g. sodium salts, of the anilides specified under (C). (I) Soluble salts, e.g. hydrochlorides, of the condensed arsenoaryl derivatives described under (E), where the salt-forming acid group is attached to the amino groups of the arsenoaryl nuclei.—J. F. B.

Oxycholesterin; Process of obtaining —. I. Lifschütz, Hamburg, Germany. U.S. Pat. 1,284,724, 12.11.18. Appl., 24.2.17.

OXYCHOLESTEROL is prepared by dissolving cholesterol in a neutral solvent (e.g., a carbon-chlorine compound), or a mixture of solvents, having a boiling point below 100° C., and then heating with a mild oxidising agent, e.g., a peroxide, with or without addition of acid.

Cetyl alcohol; Process of obtaining —. S. Axelrad and I. Hochstadter, New York. U.S. Pat. 1,290,870, 14.1.19. Appl., 14.1.18.

A CETYL ester (spermaceti) is saponified by means of lime and the product is heated, first to about 100° C. to drive off water, and then to about 340° C. to distil off the cetyl alcohol.—L. A. C.

Urea; Manufacture of —. K. Neresheimer, C. Bosch, and A. Mittasch, Assignors to Badische Anilin u. Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,292,619, 21.1.19. Appl., 20.12.16.

SEE Eng. Pat. 24,042 of 1914; this J., 1916, 71.

Ergot; Process for the manufacture of a product derived from — soluble in water and suitable for injections. A. Gams, Assignor to Soc. of Chem. Ind. in Basle, Switzerland. U.S. Pat. 1,292,394, 21.1.19. Appl., 23.10.17.

SEE Eng. Pat. 119,287 of 1917; this J., 1918, 717 A.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic reduction with ferric ammonium sulphate. H. Krause. Z. Wiss. Phot., 1918, 18, 192—197.

Ferric alum in neutral solution slowly reduces the intensity of photographic images, but more rapidly in slightly acid solution. Changes of temperature and concentration and the presence of chloride ions have little effect on the definition of the reduced image. A neutral solution converts the silver of the plate partly into soluble silver sulphate and partly into an insoluble compound, probably silver oxide. The formation of the insoluble compound is prevented by the presence of acid and this probably explains the more rapid action of the acidified solution.—J. F. S.

XXII.—EXPLOSIVES; MATCHES.

Nitro-groups. Druce. See III.

PATENTS.

Explosive; High —. J. D. Thompson, Toronto, Canada. U.S. Pat. 1,291,258, 14.1.19. Appl. 3.4.16. Renewed 30.11.17.

THE explosive consists of potassium chlorate, ramanite (decayed felspar), wood pulp, dinitrotoluol (liquid), trinitrotoluol (solid), soluble nitrocellulose, and insoluble nitrocellulose pulped.

—T. St.

Removal of liquids [solvents] from solid materials [smokeless powders] soluble therein. E. C. R. Marks, London. From E. I. Du Pont de Nemours Powder Co., Wilmington, Del., U.S.A. Eng. Pat. 24,296, 18.12.14.

SEE FR. Pat. 477,343 of 1915; this J., 1916, 618.

Explosives; Manufacture of —. W. J. Mellersh-Jackson, London. From Palmer-Perchlorate Powder Co. of Canada, Montreal, Canada. Eng. Pats. 2169 and 2172, 10.2.15.

SEE FR. Pat. 477,678 of 1915; this J., 1916, 618.

XXIII.—ANALYSIS.

Laboratory apparatus for rapid evaporation. E. C. Merrill and C. O. Ewing. J. Ind. Eng. Chem., 1919, 11, 230.

EVAPORATION of liquids in basins on a steam-bath is accelerated by a blast of air, which is first passed through a screw-capped brass cylinder, 3 cm. by 15 cm., packed with cotton to act as a filter, and then through a heating coil of copper tube 2 m. by 0.6 cm., which rests upon the steam pipes in the bath, and has its outlet raised above the bath, and connected by means of rubber tubing with a series of nozzles. Each of these is provided with a glass stop-cock, and is supported by a bent wire which slides within a hollow standard, thus enabling the height of the nozzle above the bath to be adjusted. The air issuing from the nozzle is at about 60° C. By its use water can be evaporated in less than half the usual time, and 95% alcohol in about one-sixth of the time. The apparatus is also useful for the rapid evaporation at low temperatures of substances which readily volatilise or polymerise at higher temperatures.

—C. A. M.

Copper oxide; Use of — for combustions in gas analysis. E. Ott. J. Gasbeleucht., 1919, 62, 89—90.

THE author has studied different factors affecting the accuracy of determinations of carbon monoxide, hydrogen, and methane in gas analysis by combustion over copper oxide. If chemically pure nitrogen is passed 10—15 times over brightly glowing copper oxide, dissociation of the copper oxide is found to take place to a certain extent, depending upon the temperature, the velocity of the gas, etc. If, however, the nitrogen, together with the dissociated oxygen, be again led 5 to 10 times over the copper oxide at a lower temperature, i.e., at a dull red heat, quantitative re-absorption of the oxygen takes place. Care should be taken however that the temperature does not fall below that for dull red heat, as the activity of the reduced copper then rapidly diminishes. Nitrogen prepared from air free from carbon dioxide by allowing it to stand over phosphorus contains phosphorus vapour as an impurity. If nitrogen prepared by this means is passed over copper oxide as described above, a contraction of about 0.2% is observed, and although the gas is sufficiently pure for purposes of technical analysis, particularly as the phosphorus vapour can be removed by passing the gas over copper oxide at a dull red heat before delivering it to the apparatus, absorption of the oxygen from the air by means of pyrogallol must be employed for preparing nitrogen for extremely accurate work. No chemical action has been found to take place between the nitrogen and the copper oxide. During the combustion of chemically pure methane and carbon monoxide, a contraction of at least 0.5% has always been observed, in spite of the utmost precautions being taken to render the apparatus gas-tight.—L. A. C.

Gold; Use of o-tolidine as a colorimetric test for —. W. B. Pollard. Analyst, 1919, 44, 94—95.

ONE part of gold (as gold chloride) in 1 million parts of water gives a bright yellow coloration when treated with a 0.1% o-tolidine solution in 10% hydrochloric acid; with a solution containing 1 part of gold in 20 million the yellow coloration can just be detected in a depth of 10 cm. of liquid. Ferric salts, ruthenium, osmic acid, and vanadic acid also give a yellow coloration with the reagent, but the following metals, when present as chlorides, do not react:—aluminium, antimony, barium, bismuth, cadmium, calcium, chromium, cobalt, copper, iridium, lead, magnesium, mercury, manganese, nickel, platinum, rhodium, sodium, strontium, tin, uranium, and zinc. The solution to be tested should be free from nitrous acid and reducing substances. If copper is present a green coloration is obtained instead of pure yellow.—W. P. S.

Quinisol (potassium salt of 8-hydroxyquinoline-5-sulphonic acid); Reaction products of — [and of "superol" (o-hydroxyquinoline sulphate)] with different metals. N. Schoorl. Pharm. Weekblad, 1919, 56, 325—328.

EXTREMELY delicate reactions are given by quinisol or "superol" (o-hydroxyquinoline sulphate) with arsenic (arsenate), barium, mercury (mercurous), lead, strontium, tin (stannous and stannic), iron (ferrous), and silver. The precipitates formed are microcrystalline and of most characteristic appearance. The reagent is well adapted to micro-analysis.—W. S. M.

Analysis of coal. Zschimmer. See IIa.

Fusioa bomb. Parr. See IIa.

Gasoline in natural gas. Oberfell and others. *See* IIA.

Tar vapour in producer-gas. Zschimmer. *See* IIA.

Petrol. Philip. *See* IIA.

Determination of carbazole. Clark. *See* III.

Nitro-groups. Druce. *See* III.

Lead in lead salts. Morris. *See* VII.

Carbon monoxide in hydrogen. Rideal and Taylor. *See* VII.

Glass analysis. Allen and Zies. *See* VIII.

Oxygen in iron. Oberhoffer. *See* X.

Iron and steel. Marinot. *See* X.

Phosphorus in steel etc. Travers. *See* X.

Chrome ironstone. Moir. *See* X.

Varnish analysis. Pearce. *See* XIII.

Nitrates in soil. Noyes. *See* XVI.

Rock phosphate and dilute acids. Stenius. *See* XVI.

Nitrous fumes in air. Toombs. *See* XIXa.

Red cinchona bark. Partridge. *See* XX.

PATENTS.

Gas-analysing apparatus. Aktiebolaget Ingeniörs-firma F. Egnell, Stockholm. Eng. Pat. 120,921, 20.11.18. (Appl. 19,066/18.) Int. Conv., 29.11.17.

Is a gas-analysing apparatus in which the gas passes successively through a measuring receptacle, an absorbing receptacle, and another measuring receptacle, a valved by-pass is provided by means of which the gas can be passed direct from the first to the second measuring vessel when the zero point of the apparatus is to be determined.—W. F. F.

Melting points; Method of determining —. L. W. Chubb, Edgewood Park, and R. de S. Brown, Wilkinsburg, Pa., Assignors to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,291,409, 14.1.19. Appl., 6.5.15.

The material to be tested is placed in contact with a thermocouple which is heated at a uniform rate by an electric current. The couple is also connected with an electrical measuring instrument and the value of the potential generated by the couple is observed at the point at which the progressive increase in the generated potential is interrupted by reason of the absorption of heat at the melting point of the material under test. The couple consists of a thin plate composed of the two portions butt-welded together, and is notched to localise the applied heat at the junction point of the two materials.—T. St.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Adams. Direct-displacement ejectors for raising and forcing liquids and semi-solids etc. 7992. Mar. 31.

Aston. 8777. *See* X.

Barron. 8402. *See* XIX.

Bentall and Bingham. Grinding-mills. 8524. Apr. 4.

Blakeley, Firth, Blakeley, Sons and Co., and Shaw. Assorting materials of different specific gravities and washing same. 8851. Apr. 8.

Brockway. 7986, 7987, 8058, 8059. *See* II.

Cruyt and Heenan. System of superheating steam from boilers. 8319. Apr. 2.

Cubley, and Harvey and Co. 8117. *See* X.

Duvieusart. Exchanging heat of liquids. 8424. Apr. 3.

Godwin and Pitman. Device for heating liquids. 8343. Apr. 2.

La Bour. Intimate mixing of fluids. 8444. Apr. 3. (U.S., 8.4.18.)

Lafenille. 8979. *See* XVII.

Parr. Methods of recovering vapours of volatile liquids when mixed with air. 8508. Apr. 4.

Roots (Kaegi). Straining or filtering device for liquids. 9109. Apr. 10.

Smith. Furnaces. 8445. Apr. 3. (U.S., 3.4.18.) Soc. Chim. des Usines du Rhône anc. Gillard, Monnet, et Cartier. Carrying out chemical reactions by catalysis. 8537. Apr. 4. (France, 3.5.18.)

Stewart. Vessels for containing liquefied gases etc. 8809. Apr. 8.

Sturtevant. Separators for grading crushed rock etc. 9032. Apr. 9.

Tiernan and Wallace. Packing-materials, and processes for making same. 8797. Apr. 7. (U.S., 28.8.18.)

White (Crane Packing Co.). Packing. 9028. Apr. 9.

Wirth-Frey. Evaporation of solutions. 9191. Apr. 10. (Germany, 3.6.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

9863 (1917). Hinchley. Apparatus for expressing liquid from materials containing the same. (124,530.) Apr. 9.

5691 (1918). Soc. Anon. Fonderie Officine Frejus-automobili Diatto. Apparatus for regulating the pressure of and cooling compressed air or other fluid. (115,822.) Apr. 9.

5728 (1918). Spence and Young. Machines or apparatus for filling measured quantities of jelly and like viscous or fluid substances into pots or other vessels. (124,884.) Apr. 16.

5919 (1918). Lonsdale. Non-conducting coating for insulating pipes and other vessels or articles in chemical work. (124,597.) Apr. 9.

6202 (1918). Huelin. Means for preventing or consuming smoke in furnaces. (124,603.) Apr. 9.

6233 (1918). Donald. Kilns. (124,909.) Apr. 16.

6444 (1918). Scheffers and Van Roggen. Kilns. (115,252.) Apr. 16.

6960 (1918). Newell and Co., and Woodhouse. Grinding-mills. (124,930.) Apr. 16.

9921 and 20,917 (1918). Furness. Filter press

plate for filtering acid and other liquid material. (124,974.) Apr. 16.

11,402 and 11,407 (1918). Wade (Pittsburgh Testing Laboratory). *See* II.

11,781 (1918). British Dyes, Ltd., Turner, and West. Tank for transporting hydrochloric acid or other corrosive liquids by rail, road, or water. (124,997.) Apr. 16.

14,230 (1918). McIntyre, and Milne and Son. Method of superimposing films of material to be dried on a pair of heated cylinders, the same being also applicable for evaporating moisture from solids. (124,668.) Apr. 9.

15,856 (1918). Newhouse. Comminuting mill. (125,012.) Apr. 16.

16,471 (1918). Bolton. Liquid sealed furnaces. (125,015.) Apr. 16.

19,253 (1918). Hopper. Crushing and drying machine. (120,931.) Apr. 9.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

Anderson. Process for combustion of fuel. 8570. Apr. 4.

Anderson. Apparatus for combustion of fuel. 8571. Apr. 4.

Bloomfield. Process of manufacturing peat fuel and briquettes. 8153. Apr. 1.

Boulton. 9136. *See* XXIII.

Brockway. Apparatus for washing and scrubbing coal gas etc. 7986. 7987. 8059. Mar. 31.

Brockway. Pan scrubbers etc. 8058. Mar. 31.

Carman. Coke-ovens. 8508. Apr. 4.

Castelli and Corthesy. Means to generate gas from coal etc. 9361. Apr. 12.

Commercial Cars, Ltd., and Thomas. Apparatus for production of gaseous fuel for internal-combustion engines. 8750. Apr. 7.

Evans. Utilisation of trinitrotoluene for production of fuel gas and ammonia. 9220. Apr. 11.

Forward. Refining oil. 8627. Apr. 5.

Gardner and Hunter. Suction-gas producers. 8543. Apr. 4.

Hogan. Incandescence lamps. 8669. Apr. 5.

Mellersh-Jackson (Standard Oil Co.). Sulphonic acids of petroleum oils, and process of producing same. 8628. Apr. 5.

Mellersh-Jackson (Twitchell Process Co.). Sulphonated products of mineral oils, and process of producing same. 8635. Apr. 5.

Mellersh-Jackson (Twitchell Process Co.). Sulphonic acids of mineral oils, and process of producing same. 8638. Apr. 5.

Mellersh-Jackson (Twitchell Process Co.). Alkali-metal sulphonate, and process of producing same. 8643. Apr. 5.

Naito. 8708. *See* XXIII.

Nielsen. Process for manufacturing a peat fuel. 8559. Apr. 4. (Denmark, 30.3.18.)

Proctor. Electric arc lamps. 9053. Apr. 9.

Rowlson and Wilson. Coal-dust blocks. 9384. Apr. 12.

Smith. Treatment of coal. 8443. Apr. 3. (U.S., 3.4.18.)

Smith. Gas-producers. 8602. Apr. 5.

Spicer (Wells). Gas-producers. 8193. Apr. 1.

Wadsworth. Composition for economy of fuel. 9053. Apr. 10.

COMPLETE SPECIFICATIONS ACCEPTED.

112 (1916). Shakespear. *See* XXIII.

177 (1916). Westercamp. Arc lamps. (124,455.) Apr. 6.

849 (1916). Dreyfus. Process for effecting the separation of nitro compounds from natural oils. (124,475.) Apr. 9.

5036 (1916). Mackie. *See* VII.

11,212 (1917). Gasoline Corporation. Art of cracking hydrocarbon oils. (115,014.) Apr. 9.

5051 (1918). Longsdon. *See* XII.

5816 (1918). Wirtz. Means for purifying and vaporising oils. (124,895.) Apr. 16.

6202 (1918). Huelin. *See* I.

6749 (1918). Bell. Carburettors for coal or water gas. (124,610.) Apr. 9.

7972 (1918). Sheard. *See* VII.

8330 (1918). Reed. Extraction of hydrocarbon products from shales and coals. (119,648.) Apr. 9.

9037 (1918). Wade (China Sugar Refining Co., Shaw, and McTavish). Decolourising carbon and the preparation thereof. (124,638.) Apr. 9.

10,914 (1918). Flood and Flood. Method of and apparatus for quenching coke. (124,652.) Apr. 9.

11,402 and 11,407 (1918). Wade (Pittsburgh Testing Laboratory). Process of regenerating lubricants. (124,990 and 124,991.) Apr. 16.

11,453 (1918). Milbourne. Gas purifiers. (124,994.) Apr. 16.

16,826 (1918). Leendertze. Process for briquetting refuse. (120,209.) Apr. 9.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

Anderson. Treatment of coal tar etc. 8414. Apr. 3.

Loe. Process for manufacture of aromatic phenols and amines. 9082. Apr. 10.

Mellersh-Jackson (Standard Oil Co.). 8628. *See* II.

Mellersh-Jackson (Twitchell Process Co.). 8635. 8638. 8643. *See* II.

Morris. Tar distilling. 8525. Apr. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

849 (1916). Dreyfus. *See* II.

11,212 (1917). Gasoline Corporation. *See* II.

6306 (1918). Thorp and Thorp. Recovery of benzol and other useful products from acid tars obtained in refining operations. (124,605.) Apr. 9.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

Vidal and Vidal. Production of sulphur black dyes. 8766. Apr. 7.

Vidal and Vidal. Preparation of sulphur dyes. 8767. Apr. 7.

COMPLETE SPECIFICATIONS ACCEPTED.

1442 (1916). Holliday and Badier. *See* XXII.

5519 (1918). Wyler, and Levinstein, Ltd. Sulphur dyestuff. (124,589.) Apr. 9.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

Denis. Machine for spinning, washing, and drying viscose threads. 8878. Apr. 8. (Belgium, 8.8.13.)

Dorr Co. Process of recovering alkali used in pulp digestion. 8086. Mar. 31. (U.S., 16.8.18.)

Fort, Lumsden, Mackenzie, and Robinson. Beetling and treatment of fabrics etc. 8616. Apr. 5.

Fort, Lumsden, Mackenzie, and Robinson. Treatment of yarns, fabrics, etc. 8684. Apr. 7.
 Frood. Manufacture of fibrous fabrics or compositions. 8480. Apr. 4.
 Haigh. Papers for use as dielectric for electrical condensers etc. 8969. Apr. 9.
 Martin and Martin. Paper-making machines. 8692. Apr. 7.
 Stone. Couching of paper webs in paper-making machines. 8134. Apr. 1.

COMPLETE SPECIFICATIONS ACCEPTED.

71 (1916). Tesse. *See* XIII.
 1755 (1916). Mandleberg, and Mandleberg and Co. Impregnation of fabrics or materials. (124,494.) Apr. 9.
 1756 (1916). Mandleberg, and Mandleberg and Co. Impregnation and coating of fabrics and the like. (124,495.) Apr. 9.
 3012 (1916). Harrison and Bacon. Manufacture of paper. (124,516.) Apr. 9.
 3217 (1916). Glazebrook, Rouse, and Johnston. Fabrics used in the manufacture of balloons and dirigible airships. (124,520.) Apr. 9.
 5387 (1916). Zimmer and others. *See* XIII.
 15,059 (1916). Leurquin. Process for preparing a canvas or other ground or surface for receiving an impression in one or more colours. (124,843.) Apr. 16.
 4284 (1917). Tesse. Treatment of fabrics, and particularly the treatment of aeroplane fabrics. (124,844.) Apr. 16.
 10,568 (1918). Manchester Oxide Co., Clayton, Huebner, and Williams. Manufacture of parchmentized paper, vulcanised fibre, and the like. (124,979.) Apr. 16.
 11,303 (1918). Schweizerische Versuchsanstalt für Textilindustrie. *See* XXIII.
 15,772 (1918). Schaufelberger. Digesters for use in the manufacture of cellulose and like operations. (124,676.) Apr. 9.
 17,592 (1918). Mackenzie. *See* XIII.
 19,203 (1918). Konagai. Waterproof paper. (124,689.) Apr. 9.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Cliffe and Wilde. Treating or finishing fabrics. 9233. Apr. 11.
 Davis. Dyeing-machines. 9108. Apr. 10.
 Sharp. Means of fastening dyes in material and waterproofing same. 8360. Apr. 3.

COMPLETE SPECIFICATION ACCEPTED.

17,620 (1918). Bright and Bros., and Evans. Machines for boiling, bleaching, dyeing, sizing, or similarly treating yarns or fabrics. (125,025.) Apr. 16.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Allen. Plant for manufacture of salt from brine etc. 8952. Apr. 9.
 Ashcroft. Process for production of anhydrous magnesium chloride or anhydrous carnallite. 8091. Mar. 31.
 Calvert and Commis. Production of cyanide. 8416. Apr. 3.
 Damman. Process for purifying rock salt or sea salt. 8881. Apr. 8.

Davis. Extraction of arsenic etc. from sulphuric acid. 8776. Apr. 7.
 Dorr Co. 8086. *See* V.
 Evans. 9220. *See* II.
 Industrial Inventions, Ltd., and Perry. Synthesis of ammonia. 8544. Apr. 4.
 Lindsay Light Co. Manufacture of thorium compounds. 8585. Apr. 4. (U.S., 8,718.)
 Shroff. Process for preparation of barium chloride etc. 8152. Apr. 1.
 Taylor and Vivian. Production of arsenic. 8542. Apr. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

2847 (1916). Freeth and Cocksedge. Separation and recovery of potassium salts from commercial nitrate of soda containing such salts. (124,513.) Apr. 9.
 4483 (1916). Gillbert. Manufacture of calcium nitrate from calcium chlorides and sodium nitrate. (124,780.) Apr. 16.
 5036 (1916). Mackie. Apparatus for the manufacture of hydrogen. (124,798.) Apr. 16.
 6026 (1916). Maxted and Ridsdale. Manufacture of a hydrogen/nitrogen mixture. (124,824.) Apr. 16.
 872 (1918). Mills, Packard, and Packard and Co. Chambers used in the manufacture of sulphuric acid. (124,852.) Apr. 16.
 1520 (1918). Roake, Roberts, and Co., and Durrans. Manufacture or preparation of sulphuryl chloride. (124,542.) Apr. 9.
 4774 (1918). Rigaud. Production of sulphates of copper or nickel from ores and metallic minerals. (116,263.) Apr. 9.
 5072 (1918). Dutt and Dutt. Process for the manufacture and production of alumina, sodium and potassium aluminates, sodium and potassium carbonates, and potassium chloride. (124,553.) Apr. 9.
 5073 (1918). Dutt and Dutt. Process for the manufacture and production of alumina, sodium and potassium carbonates, sodium and potassium aluminates, magnesia, and calcium chloride. (124,554.) Apr. 9.
 7972 (1918). Sheard. Manufacture of sulphate of ammonia. (124,946.) Apr. 16.
 9283 (1918). Bailey, Denny, and Jefferis. Separation of potassium nitrate from sodium nitrate. (124,960.) Apr. 16.
 9021 and 20,917 (1918). Furness. *See* I.
 10,478 (1918). Dutt and Dutt. Process for the manufacture and production of manganese dioxide. (124,977.) Apr. 16.
 11,253 (1918). Roge. Recovery of acid from acid alkali sulphates. (124,988.) Apr. 16.
 11,781 (1918). British Dyes, Ltd., and others. *See* I.
 12,000 (1918). Norsk Hydro-Elektrisk Kvaestofaktieselskab. Production of ammonia from cyanamide. (120,034.) Apr. 9.
 388 (1919). Elektrizitätswerk Lanza. Manufacture of mercuric oxide. (122,195.) Apr. 16.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Kennett and others. 9079. *See* IX.
 Thame. Manufacture of refractory material. 8144. Apr. 1.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Ivinson and Roberts. Manufacture of Portland etc. cement. 8217. Apr. 1.

Juthy. Roofing-tiles, and method of manufacturing same. 8400. Apr. 3.

Kennett, Kennett, and Kennett. Kilns for burning bricks, cement, etc. 9079. Apr. 10.

Lowndes. 8194. *See X.*

Naaml. Vennoots. Hollandsche Asbest-Cement Fabriek. Manufacture of plates of Portland cement reinforced with fibres. 9393. Apr. 12. (Holland, 30.7.18.)

Staddon. Preparation for protecting logs from decay. 9291. Apr. 11.

COMPLETE SPECIFICATIONS ACCEPTED.

18,171 (1917). Baker. Method of waterproofing pavement and road-making and the like materials. (124,851.) Apr. 16.

10,538 (1918). Herdman. Manufacture of mineral wool. (124,650.) Apr. 9.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Aston. Crucible furnaces. 8777. Apr. 7.

Barkes, Besford, and Day. Solder for aluminium etc. 8667. Apr. 5.

Brandt and Brandt. Alloys for war purposes. 9087. Apr. 10. (France, 19.6.17.)

Cowper-Coles. Process for protection of iron and steel from corrosion. 8902. Apr. 8.

Cubley, and Harvey and Co. Gas-heated crucible furnaces. 8117. Apr. 1.

Gray, and Wellman, Seaver and Head, Ltd. Steel-making etc. furnaces or mixers. 8890. Apr. 8.

Hancock. Method of preventing metals from tarnishing and rusting. 8054. Mar. 31.

Harris. Process for coating metal upon metal etc. surfaces for electrotyping, sound-producing records, etc. 8023. Mar. 31.

Harris. Refining lead. 9147. Apr. 10.

Heyes. Electric welding. 8257. Apr. 2.

Iverson and Roberts. 8290. *See XIII.*

Lowndes. Treatment of blast-furnace slag etc. 8194. Apr. 1.

Minerals Separation, Ltd. (Emerson). Concentration of ores. 8165. Apr. 1.

Saracchi. Soldering-composition. 8210. Apr. 1. (Switz., 10.1.19.)

Soc. Anon. Stabilimenti Blak. Zinc alloy. 9012. Apr. 9. (Italy, 12.4.18.)

Tidswell. Method of casting aluminium on to wrought iron or steel. 8280. Apr. 2.

Wolf. Method of granulating or pulverising metals etc. 9041. Apr. 9.

COMPLETE SPECIFICATIONS ACCEPTED.

531 and 533 (1916). Dear, and Miris Steel Co. Manufacture of steel. (124,463 and 124,465.) Apr. 9.

532 and 11,426 (1916). Dear, and Miris Steel Co. Manufacture of steel. (124,464.) Apr. 9.

5756 (1916). Whyte. Manufacture of iron and steel. (124,816.) Apr. 16.

5765 and 8803 (1916). Hadfield. Manufacture of manganese steel. (124,817.) Apr. 16.

1174 (1918). Martin and Richards. Furnaces for roasting ores. (124,540.) Apr. 9.

4774 (1918). Rigaud. *See VII.*

4859 (1918). Abrahamsen and Pedersen. Manufacture of sheet metal plate with a protective metal coating. (124,548.) Apr. 9.

5696 (1918). Forrester. Process for melting tin, and apparatus for use therein. (124,594.) Apr. 9.

7505 (1918). Crocker and Crocker. Manufacture of zinc. (124,621.) Apr. 9.

10,553 (1918). Wilkes and Harris. Reverbera-

tory furnaces for use in the recovery of zinc from dross. (124,978.) Apr. 16.

17,579 (1918). Hall, and Rolls-Royce, Ltd. Aluminium alloy. (124,683.) Apr. 9.

18,396 (1918). Murray. Methods of and apparatus for electrical welding. (120,906.) Apr. 16.

113 (1919). British Thomson-Houston Co. (General Electric Co.). Treatment of metals. (125,046.) Apr. 16.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Goodman. Electric batteries. 9276. Apr. 11.

Haigh. 8969. *See V.*

Heyes. 8257. *See X.*

Ivey and Salisbury. Storage batteries. 8560. Apr. 4.

Lotsch. Storage batteries. 9175. Apr. 10.

Quain. Apparatus for production of ozone. 8338. Apr. 2.

Steiger. Electric furnaces. 8795. Apr. 7. (Switz., 8.4.18.)

Wade (Thomson). Electrical resistance elements. 8352. Apr. 2.

Wade (Thomson). Carbon conductors for electricity. 8642. Apr. 5.

COMPLETE SPECIFICATION ACCEPTED.

18,396 (1918). Murray. *See X.*

XII.—FATS; OILS; WAXES.

COMPLETE SPECIFICATIONS ACCEPTED.

1783 (1918). Downs, Bellwood, and Turnill. Method or process of extracting oil from vegetable seeds and nuts. (124,856.) Apr. 16.

5051 (1918). Longsdon. Apparatus for recovering waste oils or separating oil from water or other impurities. (124,551.) Apr. 9.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Iverson and Roberts. Paint or composition for covering surface of metals. 8290. Apr. 2.

Lane. Paints. 9107. Apr. 10.

COMPLETE SPECIFICATIONS ACCEPTED.

2879 (1916). British Enamillite Co., and Goldsmith. Manufacture of dopes. (124,515.) Apr. 9.

5387 (1916). Zimmer, Bryce, and Davies. Cellulose-acetate compositions for use as varnishes, lacquers, and for other purposes. (124,807.) Apr. 16.

5092 (1918). Hutchins. Manufacture of lamp-black. (124,557.) Apr. 9.

17,592 (1918). Mackenzie. Dissolving and breaking down of shellac for use in hat manufacture and other purposes. (124,684.) Apr. 9.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

COMPLETE SPECIFICATIONS ACCEPTED.

3217 (1916). Glazebrook and others. *See V.*

5758 (1918). Porzel. Process for treating rubber. (124,887.) Apr. 16.

5759 (1918). Porzel. Method and machine for vulcanising rubber and similar substances. (124,888.) Apr. 16.

XV.—LEATHER; BONE; HORN; GLUE.

COMPLETE SPECIFICATIONS ACCEPTED.

11,417 (1918). Walker. Plant or means used in the treatment of hides during soaking, liming, tanning, chroming, or like processes. (124,992.) Apr. 16.

17,486 (1918). Bendixen. Process for tanning fish skins or the like. (120,398.) Apr. 16.

XVI.—SOILS; FERTILISERS.

COMPLETE SPECIFICATION ACCEPTED.

8434 (1918). Bottomley. Treatment of peat for making useful products. (124,629.) Apr. 9.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

Hardy, and Beckett and Sons. Manufacture of rice starch. 8741. Apr. 7.

Lafenille. Rotary mixing-machines for sugar refineries etc. 8979. Apr. 9.

COMPLETE SPECIFICATION ACCEPTED.

9037 (1918). Wade (China Sugar Refining Co., and others). *See* II.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Barron. Sand-filters. 8402. Apr. 3.

Benenati. Process for preserving matter. 8637. Apr. 5. (U.S., 31.5.18.)

Casablanca. Product obtained from waste water of houses, factories, etc. 8778. Apr. 7.

Clayton and Nodder. Manufacture of butter substitutes, edible fats, etc. 8757. Apr. 7.

Higginbottom. Apparatus for separating and purifying wheat etc. 8901. Apr. 9.

Hilliard and Judge. Firing or drying tea leaf. 8189. Apr. 1.

Hiorth. Method for preservation of food. 8064. Mar. 31. (Norway, 6.4.18.)

Mousley. Process for obtaining a substitute for human milk from cows' etc. milk. 9216. Apr. 11.

O'Connor. 9154. *See* XX.

Walsh. Water-filter. 8002. Mar. 31.

COMPLETE SPECIFICATIONS ACCEPTED.

9796 (1918). Crossley. Process for treating powdered or other dried eggs to render them emulsifiable. (124,968.) Apr. 16.

14,353 (1918). Marquis. Food compound. (125,009.) Apr. 16.

14,863 (1918). Sutherland. Process for treating meal or flour and milling products. (121,943.) Apr. 9.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Christiansen. Manufacture of methyl alcohol. 8320. Apr. 2. (Denmark, 20.4.18.)

Confectionery Ingredients, Ltd., Kane, King, and Matthews. Manufacture of protocatechuic aldehyde. 8178. Apr. 1.

Hanly and Lush. Production of formaldehyde, formic acid, and derivatives thereof. 8067. Mar. 31.

Leach, and United Alkali Co. Manufacture of acetic anhydride. 8552. Apr. 4.

O'Connor. Preparation of perfumes, fruit essences, and flavourings. 9154. Apr. 10.

Sandoz Chemical Works. Process for manufacture of a highly active preparation of ergot and isolation of its principal alkaloid in pure crystallised state. 9006. Apr. 9. (Switz., 9.4.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

12,714 (1918). Orton. Manufacture of tetranitromethane. (125,000.) Apr. 16.

3541 (1919). Crosfield and Sons, and Hilditch. Manufacture or production of acetaldehyde. (124,702.) Apr. 9.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATIONS.

Donisthorpe. Photographic printing. 8373. Apr. 3.

Portass, Portass, and Portass. Development and chemical treatment of photographic film. 8689. Apr. 7.

COMPLETE SPECIFICATION ACCEPTED.

6435 (1918). Smith. Production of screens for half-tone and other photographic printing surfaces. (124,608.) Apr. 9.

XXII.—EXPLOSIVES; MATCHES.

APPLICATIONS.

Evans. 9220. *See* II.

Holgate. Nitrate of cellulose. 8983. Apr. 9.

COMPLETE SPECIFICATIONS ACCEPTED.

317 (1916). Chance and Hunt, Holley, and Mott. Nitration process and apparatus therefor. (124,461.) Apr. 9.

849 (1916). Dreyfus. *See* II.

1442 (1916). Holliday and Badler. Process of manufacture of picric acid from dinitrophenol in crystal form and the elimination therefrom of the sulphate of lead. (124,490.) Apr. 9.

5178 (1916). Clayton Aniline Co., Schedler, and Marchant. Process for the purification of tri-nitro-toluene. (124,803.) Apr. 16.

12,714 (1918). Orton. *See* XX.

XXIII.—ANALYSIS.

APPLICATIONS.

Boulton. Absorption apparatus for analysing gases. 9136. Apr. 10.

Naito. Analysing or estimating volatile constituents of coal. 8708. Apr. 7.

COMPLETE SPECIFICATIONS ACCEPTED.

112 (1916). Shakespear. Apparatus for the detection and measurement of gases. (124,453.) Apr. 9.

11,303 (1918). Schweizerische Versuchsanstalt für Textilindustrie. Process and apparatus for testing fabrics and other materials. (124,183.) Apr. 9.

I.—GENERAL; PLANT; MACHINERY.

Suspensions and smokes; Relation between the intensity of Tyndall beam and concentration of —. R. C. Tolman, L. H. Reyerson, E. B. Vliet, R. H. Gerke, and A. P. Brooks. J. Amer. Chem. Soc., 1919, **41**, 300—303.

THERE is a strict proportionality between the concentration of liquid suspensions and smokes and the strength of the Tyndall beam, provided that the particles are of the same size and the concentration does not become high enough to give a degree of opacity which affects the results.—J. F. S.

Smoke; Disappearance of — in an enclosed space. R. C. Tolman, E. B. Vliet, W. McG. Peirce, and R. H. Dougherty. J. Amer. Chem. Soc., 1919, **41**, 304—312.

SMOKE disappears in an enclosed space owing to coagulation, to settling, and to the diffusion of the particles to the walls, where they adhere. The rate of disappearance is increased by stirring, because of increased contact with the walls. The rate of disappearance of finely divided smoke of a given concentration is greater than that of a coarse smoke of the same concentration owing to the increased opportunity for coalescence. In smokes with the same size of particle the rate of disappearance increases with the concentration owing to increased chances of coagulation and removal by the walls.—J. F. S.

Thermal conductivity of laggings. Von Rinsum. See VIII.

PATENTS.

Drying goods in bulk; Apparatus for —. A. Hofmann, Zürich, Switzerland. Eng. Pat. 123,923, 14.8.18. (Appl. 13,200/18.)

THE material to be dried is conveyed by an endless conveyor in a zigzag path, through a chamber from top to bottom, whilst heated air is passed upwards through the chamber. The conveyor consists of transverse plates pivoted on one side to the joint pins of the endless chain. Guides below the section of the conveyor which is just emptying its contents on to the section below, are curved in such a way that the transverse plates are tilted and the openings between them widened so as to discharge the material gradually on to the conveyor below. The guides for this latter section are curved so as to bring back the plates passing over the wheels into line to receive the falling material. The guide wheels outside the chamber for guiding the conveyor back to the top of the chamber are mounted on bell crank levers under the action of springs, so that the chain is kept in tension notwithstanding its expansion by the heat of the chamber. The combustion gases used to heat the material are passed from the furnace through zigzag horizontal pipes in the lower part of the chamber and then upwards through an external flue to the top of a series of zigzag horizontal pipes in the drying chamber between the conveyor sections, and then through horizontal pipes below the first-mentioned pipes. The drying air is passed upwards first over the latter coolest pipes and then over the hottest pipes, and finally over the upper set of pipes and the layers of material. The heating pipes are provided with hoods and inclined plates above them to mix the air and deflect any material which falls through the conveyor.—W. F. F.

Tunnel-dryer. G. D. Harris, Bayonne, N.J. U.S. Pat. 1,282,822, 29.10.18. Appl., 10.11.15.

THE material to be dried is placed in superposed trays mounted in wheeled cars which can be moved into and out of the drying chamber or tunnel. A drying medium is circulated back and forth through the tunnel and through the spaces between the trays, and heaters are arranged in the circuit for the purpose of keeping the drying medium in an efficient condition.

Drum dryer consisting of several horizontal concentric drying cylinders. O. Günster, Dillingen. Ger. Pat. 309,034, 10.12.16.

ON the inside and outside of the walls of the cylinders are fitted wedge-shaped projections which, as the drum rotates, force the material forward, alternately in opposite directions, through the successive annular spaces between the cylinders.

—L. A. C.

Drying gases. T. W. S. Hutchins, Middlewich. Eng. Pat. 124,045. (Appls. 4443, 13.3.18, and 14,933, 13.9.18.)

THE drying liquid and the gas to be dried pass in counter-current through a number of drying compartments arranged either vertically or horizontally. In each compartment, a portion of the gas either before or after drying, is injected through spray tubes provided with nozzles placed below the surface of the drying liquid. The remainder of the gas passes through the liquid spray so produced. The apparatus may be used for drying chlorine by means of concentrated sulphuric acid.

—J. S. G. T.

Corrosion and pitting of the tubes, ferrules, doors, and other parts of surface condensers and the like; Apparatus for the prevention of —. L. J. Kettle, Dublin. Eng. Pat. 123,961, 11.12.18. (Appl. 20,605/18.)

FOR the electrical protection of surface condensers etc. against corrosion, the electrodes take the form of metallic gratings of such size as practically to cover the tube-plates and water-heads. The gratings are sufficiently open so as not to interfere with the flow of water, and are mounted on plugs of hardwood or fibre, driven into the ends of two or more of the tubes. Electrical connection with the gratings is made by means of conductors passing through insulators in the condenser casing.

—C. A. K.

Expressing liquid from material containing the same; Processes and apparatus for —. J. W. Hinchley, London, and G. Gorton, Bexhill-on-Sea. Eng. Pat. 123,774, 24.11.16. (Appl. 16,878/16.)

IN apparatus for expressing liquid from peat and other fibrous or carbonaceous materials, paper, wool, felt, fibre, and similar residues, wool-combings, sludge, sewage, fish refuse, fruit and fruit refuse, vegetables and vegetable refuse, palm kernels, copra, and the like, beet-roots, sugar cane, wood pulp and wood refuse, as described in Eng. Pats. 3998 of 1915, 14,576, 10,976, 14,601, 14,602, 14,603, 14,605, 14,606, and 15,262 of 1916 (this J., 1916, 1254; 1917, 998, 1227, 1230, 1263), the material is heated by hot fluid which does not come into direct contact with it. The press cylinder is provided with a grooved central column surrounded by a strainer and the cylindrical wall is also grooved internally and provided with a strainer. The material is heated by an internal annular cylinder traversed by the heating fluid. This annulus

D

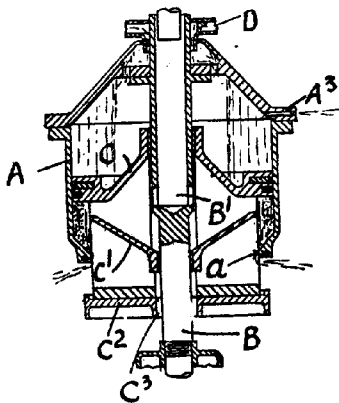
contains a ring of vertical passages connected to circular passages at top and bottom through which the fluid is supplied and exhausted. The material is pressed by two annular pistons separated by the heating annulus. In a modification, the vertical passages in the annulus contain electrical heating coils in their upper portions only, the heat being required only when the material is compressed into the upper part of the cylinder.—W. F. F.

Vapour condensers. Soc. de Moteurs à Gaz et d'Industrie Mécanique, Paris. Eng. Pat. 117,814, 20.7.18. (Appl. 11,905/18.) Int. Conv., 26.7.17.

A SMALL auxiliary condenser is arranged between a main condenser of the "mixing" type, and the air extractor, to cool the air extracted from the main condenser. A steam injector is arranged to exhaust from the top of the evaporator of the auxiliary condenser and discharge into the main condenser. The condensed and cooled water in the bottom of this evaporator is withdrawn by a small auxiliary pump operated from the shaft of the main air pump, passed through a ribbed cooling tube in the auxiliary condenser, and sprayed into the top of the auxiliary evaporator to be evaporated by the suction of the steam injector. The air extracting pipe of the main condenser discharges into the top of the auxiliary condenser so that the air and saturated vapour sweep over the ribbed tube containing the cooled water and thence to the main air pump. The vapour is thus partly condensed in the auxiliary condenser so that there is a decrease both in weight and volume of the mixed air and vapour to be dealt with by the main air pump. A modification is also described in which the auxiliary condenser is used with a main condenser of the surface type, and another modification in which the auxiliary condenser has a cold-transmitting device of the spray form instead of the ribbed tube.—W. F. F.

Centrifugal machines or separators. R. A. Sturgeon, Portsmouth. Eng. Pat. 123,797, 11.2.18. (Appl. 2438/18.)

LIQUID to be treated passes downwards through the pipe, B, and through the opening, B', into the space above the baffle, C'. The rotation of the apparatus causes the liquid to take up a position



around the periphery of the casing, A, and to force the piston, C, upwards, carrying its connected parts, C¹ and C². The disc, C², closes the open end, a, of the casing, and the lighter portion of the separated liquid escapes through the openings, C³. When a sufficient quantity of the heavier

constituent has been separated, the inflow of liquid is stopped and another liquid is supplied by the passage, D, to the upper side of the piston, C, and the pressure produced by centrifugal force moves the piston downwards and allows the discharge of the separated material over the rim, a. The second liquid escapes through an outlet, A³, which is sufficiently small to maintain the pressure within the chamber.—W. F. F.

Ash, dust and like matter; Devices for the removal of — from gases and the like. S. Brown, Glasgow. From The Bangkok Dock Co., Bangkok, Siam. Eng. Pat. 123,924, 23.8.18. (Appl. 13,741/18.)

FURNACE gases are delivered by a fan tangentially into the top of an inverted conical casing having an outlet for gas at the top, and a central outlet at the bottom which is water-sealed. The suspended matter is deposited on the inner surface of the casing and conveyed away from the water-seal which is contained in a horizontal open water-discharge conduit. In a modification, a perforated vertical discharge flue for the gas is arranged centrally in the separating chamber.—W. F. F.

Furnace; Regenerative —. A. L. Stevens, Chicago, Ill. U.S. Pat. 1,292,126, 21.1.19. Appl., 19.5.16.

A FURNACE having a heating chamber with a working orifice which is constantly open is provided with superposed regenerators having discharge openings in the top which are provided with sliding valves. Air under pressure for the combustion chamber is passed through each regenerator alternately with the combustion products, under control of the valves, by which the cross-section of the discharge opening of the regenerator from which the combustion products are being discharged may be varied.—W. F. F.

Rotary kiln. F. Tschirner, Newark, N.J., Assignor to R. G. Wagner, New York. U.S. Pat. 1,292,927, 28.1.19. Appl., 13.4.17.

THE apparatus comprises an inclined rotary kiln heated by a burner, the flame from which is directed into the lower end of the kiln. A receptacle arranged beneath the lower end of the kiln receives the material discharged from the latter and is enclosed in an insulated housing to protect the material from currents of gases. The receptacle may be heated indirectly.—J. H. P.

Fabric [filter cloth]; Coated —. E. J. Sweetland, Montclair, N.J., and F. W. Manning and W. S. Hilpert, Chicago, Ill. U.S. Pat. 1,292,535, 28.1.19. Appl., 8.2.17.

A MATERIAL suitable for use as filter cloth, and resistant to the corrosive action of fatty acids, is prepared by applying to a woven metallic fabric, so that the interstices are only partially closed, a thin coating of a substance which is inert to fatty acids, e.g., a composition containing a phenol condensation product.—S. S. A.

Filter leaf or disc. O. J. Salisbury, Assignor to United States Filters Corp., Salt Lake City, Utah. U.S. Pat. 1,293,555, 4.2.19. Appl., 31.8.17.

A CIRCULAR filter leaf or disc is composed of segmental filtering units arranged around a central shaft. Any unit can be separately disconnected from the others and from the shaft.—J. S. G. T.

Mixing apparatus. W. M. Grosvenor, Ridgewood, N.J., Assignor to Perkins Glue Co. U.S. Pat. 1,293,087, 4.2.19. Appl., 29.2.16.

A VERTICAL shaft which can be rotated at high speed is arranged axially within a mixing chamber provided with an outlet. A pipe union open below and screwed to the bottom of the shaft has open ended pipes of smaller cross-section than the bottom opening screwed into it transversely to the shaft. The material to be mixed is drawn in through the bottom opening of the pipe union and ejected through the radial pipes, above which a transverse disc is arranged within the material to be mixed. A scraper carried loosely by the shaft rotates relatively to the same.—J. S. G. T.

Refrigerating apparatus. F. G. Keyes, Boston, Mass. U.S. Pat. 1,293,469, 4.2.19. Appl., 17.1.18.

THE dead space at the top of a still furnished with cooling coils contains a compartment provided with outlets which are normally below the level of liquid in the still, and which, when the level of the solution in the still is lowered, discharge liquid from the compartment upon the cooling coils. The compartment is connected with another, external to the still, by pipes which may be artificially cooled. A portion of the distillate is stored within this external compartment and being returned to the still via the cooled pipe serves to reduce the vapour pressure in the dead space of the still.—J. S. G. T.

Treating materials; Apparatus for —. J. W. Hornsey, Summit, N.J., Assignor to General Reduction Gas and By-Products Co. U.S. Pat. 1,293,780, 11.2.19. Appl., 15.7.10. Renewed 26.8.16.

A CYLINDRICAL rotary treating chamber has its axis slightly inclined to the horizontal. A number of lipped lifting blades are arranged longitudinally within the chamber which is partitioned transversely into compartments by retarding diaphragms. The material in any compartment is lifted by the blades and distributed in a shower across the path of travel of the treating medium, passing thus into the succeeding compartment.—J. S. G. T.

Still. R. Galloworthy, Port Arthur, Tex. U.S. Pat. 1,294,357, 11.2.19. Appl., 8.6.16.

A TANK with corrugated roof constitutes an integral part of the still. Fixed troughs uniting in a shoot are arranged under the corrugations, and an annular gutter with an outlet is fixed to the still wall under the troughs.—J. S. G. T.

Gas-fired boilers; [Burners for —]. P. St. G. Kirke, London. Eng. Pat. 124,016, 12.2.18. (Appl. 2520/18.)

Roller mill scrapers. A. W. Schmidt, Lewiston, Idaho, U.S.A. Eng. Pat. 124,033, 9.3.18. (Appl. 4194/18.)

Dryer. R. W. King, The Dalles, Assignor to Pacific Evaporator Co., Portland, Oreg. U.S. Pat. 1,293,799, 11.2.19. Appl., 30.6.16.

SEE Eng. Pat. 111,994 of 1917; this J., 1918, 46 A.

Filter. E. Zahm and C. A. Nagel, Assignors to Zahm Manufacturing Co., Buffalo, N.Y. U.S. Pat. 1,294,018, 11.2.19. Appl., 25.5.17.

SEE Eng. Pat. 108,897 of 1916; this J., 1917, 1086.

Distributing liquids in scrubbers. Eng. Pat. 123,879. See II A.

Coated wooden vessel. U.S. Pat. 1,291,696. See V.

Rotary kiln. U.S. Pat. 1,292,928. See VII.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal gas; Purification of — from hydrogen sulphide. P. Schumann. J. Gasbeleucht., 1919, 62, 77—81.

GERMAN gas coals have a much lower average content of sulphur than English coals and the percentage of hydrogen sulphide in the crude gas is correspondingly smaller. As much as 60% of the hydrogen sulphide may be removed in the ammonia scrubbers. Assuming that 0.5% H₂S is present in the gas entering the oxide purifiers, it is estimated that 19,810 tons of sulphur per annum is recoverable in German gasworks.—H. J. H.

Ammonia washing and oxide purification [of gas]; Present practice in —. K. Liese. J. Gasbeleucht., 1919, 62, 113—119.

THE ammonia washing process may be either chemical or physical. Physical washers include the normal tower scrubber and the various types of mechanical and centrifugal washers. Chemical washing includes the so-called "direct" processes in which ammonia is absorbed from the crude gas by sulphuric acid as in coke-oven practice and "simultaneous" processes in which ammonia and hydrogen sulphide are removed together. The author considers that physical processes both now and, so far as can be seen, in the future will hold the field in gas-works practice in which absolutely reliable, efficient, and continuous operation is essential, the requirements on coking plants being less stringent. The tower scrubber is regarded as still the most satisfactory plant. In the author's experience trouble due to the formation of accretions among the upper tiers of filling of scrubbers can be avoided by placing on the topmost hurdle a layer of wood wool about 18 inches thick. The filling is kept clean and the wood wool requires renewal about once a year. Wash water is fed through a pipe fitted with a spraying jet and sliding concentrically in a stuffing-box through a larger pipe which is fitted with a full-bore tap. In case of stoppage the jet can be withdrawn through the tap which can then be closed, enabling the jet to be rectified without interrupting the working of the scrubber. The Raschig ring filling is advocated. The oxide purification process is discussed in relation to German practice.—H. J. H.

Gas producers. G. Marconnet. Chim. et Ind., 1919, 2, 6—14.

EXPERIMENTS on gas producers are described in which forced draught was used with the object of increasing the yield of gas from a given size of producer. A very high temperature was maintained in the producer, sufficient to fuse the clinker, and it was found that coal having a relatively high proportion of incombustible matter, up to 40%, gave the best results owing to the diminished tendency of the fused residue to solidify and obstruct the air passages. The material in the producer may have a depth of 1—5 metres and the air pressure may be 30—60 cm. of water. The proportion of carbon dioxide in the gas was about 2—3% and the capacity of the producer about 2000—3000 kilos. per sq. metre of section. When the depth of the charge was small it was found that a rectangular producer permitted a more complete penetration of the air blast into the centre of the charge. The efficiency increases with larger producers and decreases when small coal is used. In a modification, a mixture of dry coal dust and air, in the proportions necessary for the production of carbon monoxide.

was injected tangentially into a combustion chamber. The capacity of such a producer was found to be 500–1500 kilos. per sq. metre. The principal difficulty experienced was corrosion of the walls, but refractory linings of bricks consisting largely of alumina with less than 1% of iron, or graphite, were satisfactory. The best results were obtained with a water-jacketed metal wall. Results of tests on a water-tube boiler with hand and mechanical stoking, and heating by producer gas are given. The flue gases showed a steady proportion of 15–18% of carbon dioxide when a producer was combined with the boiler, and a very variable proportion of 1–10% with ordinary stoking. The evaporative power may be increased by 50% owing to the more uniform heating of the boiler tubes.—W. F. F.

Petroleum derivatives; Application of the Grignard reaction to the preparation of acids from some —. H. Wegrzyn. *Petroleum*, 1918, 13, 241–243. *Chem. Zentr.*, 1919, 90, II., 121–122.

BENZINE fractions from Boryslaw crude oil were treated with sulphuric acid to remove aromatic and unsaturated compounds, then halogenated, and treated with magnesium. The bromo-derivatives did not yield carboxylic acids. Of the chloro-derivatives from benzine (sp. gr. 0.7002, b.pt. 65°–75° C.), the fraction of b.pt. 64°–80° C. did not yield carboxylic acids, but the fraction boiling between 80° and 156° C. gave a yield of 40% of a mixture of carboxylic acids, having sp. gr. at 20° C. 0.947, b.pt. 202° to 216° C., mol. wt. 137.0. The author deduces from these values that the acids are alicyclic and that the chief constituent is hexanaphthenecarboxylic acid, $C_{11}H_{11}CO_2H$. Attempts to obtain acids from solid paraffin by the Grignard reaction, even when the experiment was conducted in an autoclave heated to 155° C., were wholly unsuccessful, from which the author concludes that only cyclic compounds are affected.

—T. St.

Paraffin wax; Theory of the process of crystallisation in the manufacture of —. E. Bergel. *Petroleum*, 1918, 14, 173–177. *Chem. Zentr.*, 1919, 90, II., 122–123.

COOLING is used exclusively in practice for the separation of paraffin wax from oil, and the more slowly this takes place, the larger are the crystals formed. Crystallisation is encouraged by dilution, but especially by increasing the solubility by the addition either of such substances as increase the solvent power of the oil, or of a suitable solvent (benzine). Viscosity is of considerable influence on crystal formation, the higher the viscosity the more numerous being the crystal-nuclei, with consequent prejudice to the formation of large crystals. Other substances such as asphalt also influence the crystallisation process, but their effect may be largely overcome by cooling in stages.—T. St.

Lignite tar. Erdmann. See III.

"Dracorubin" tests. Dieterich. See XXIII.

PATENTS.

Binding material for fuel-briquettes; Manufacture of a — from petroleum residues, lime, and rosin. K. Eisentraut, Petrograd. Ger. Pat. 309,808, 25.4.12.

A MIXTURE of 75–125 parts by weight of fluid petroleum residues, 50–100 of solid petroleum residues, and 50–75 of wood pitch or rosin is heated in a closed vessel to 130° C., then 15–50

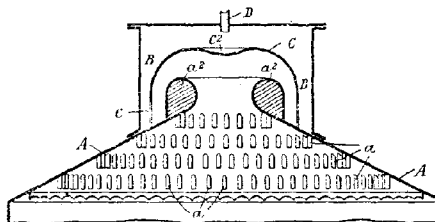
parts of powdered lime is added, and after a certain time, with continuous stirring, further heat is applied. In consequence of the preliminary heating, a smaller proportion of lime is required and the use of alkali entirely avoided. Briquettes of coal, lignite, peat, or sawdust made with this binding material are completely resistant to atmospheric influences, and burn with a long bright flame even when lean coals and anthracite are used.—J. F. B.

Coke-oven; Vertical —. A. Putsch, South Bethlehem, Pa., Assignor to F. O. Dettmann, New York. U.S. Pat. 1,292,874, 28.1.19. Appl. 4.6.15.

A VERTICAL coke oven is provided with groups of horizontal heating flues in the dividing walls, each group comprising two outer flues and an intermediate flue. The inlet ends of all the intermediate flues are connected to one regenerator so as to preheat the air which is passing into the heating flues, and the outlets of the other flues are connected to another regenerator which is thereby heated by the combustion products.—W. F. F.

Gas scrubbers; Apparatus for use in the distribution of liquids in — and for analogous purposes. J. H. Dent, and The United Alkali Co., Ltd., Liverpool. Eng. Pat. 123,879, 18.4.18. (Appl. 6598/18.)

LIQUID is supplied by the pipe, D, to the depression c^2 in the top of a dome, C, arranged in a casing, B, the liquid in which seals the openings, c. The



liquid passes over the edge, a^2 of the cone, A, which has a number of downward projections, a. The liquid spreads over the inner surface of the cone and drips from the projections, a.—W. F. F.

Gas-washing apparatus. A. L. Stevens, Assignor to O. R. Barnett, Chicago, Ill. U.S. Pat. 1,292,125, 21.1.19. Appl., 10.9.12.

GAS enters the lower end of a vertical casing and passes inwards between superposed horizontal annular washing plates in an enlargement of the casing, slightly spaced apart and mounted on a vertical rotating shaft, passing concentrically through the casing. The washing liquid passes outwards centrifugally over the surface of the plates and is discharged from the enlarged part of the casing. The washed gas passes upwards through a centrifugal fan at the top of the casing to the discharge. The washing liquid is sprayed into the top of the casing and passes through the ascending gas.—W. F. F.

Explosions [in gas-burning apparatus]; Apparatus for preventing —. The British Thomson-Houston Co., Ltd., London. From The General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 123,888, 1.5.18. (Appl. 7293/18.)

A DEVICE for preventing back-firing and explosions in tanks containing hydrogen or acetylene is placed

in the gas conduit leading from the tank, and comprises an outer vertical casing containing an inverted cup of porous refractory material resting on the bottom over the gas inlet and sealed by any suitable material. The gas inlet projects slightly through the bottom into the cup, and carries a wire gauze cage which is embedded in a quantity of pellets of lead or fusible alloy contained within the cup. The gas outlet at the top of the casing is covered by a diaphragm of wire gauze and the gas inlet pipe below the casing contains a layer of steel shot resting on a diaphragm of wire gauze. A flame travelling backwards through the gas conduit is delayed or extinguished by the wire gauze, but if it reaches the space surrounding the refractory cup is further retarded and heats the latter till the fusible pellets melt, which may stop the gas flow. If the gas inlet still remains open, the melted metal falls through the gauze cage and is trapped by the steel balls and thus seals the inlet pipe.—W F. F.

Hydrocarbon oils and residues; Treatment of — for the production of lower boiling hydrocarbons. J. G. Robertson, Partick, J. Nelson, and Petrol Patents, Ltd., Glasgow. Eng. Pat. 10,981, 29.7.15.

HYDROCARBON oils or residues in a liquid or semi-liquid state are brought into contact with pumice-stone or sandstone heated to 500° to 800° C. in a closed retort. The vapours formed are removed, e.g., by a pump, and are fractionally condensed, preferably under pressure. Viscous materials such as tars are preheated before treatment to increase their fluidity. The temperature of conversion is varied according to the hydrocarbon being treated (aromatic compounds requiring in general a higher temperature than aliphatic), the nature of the product desired, and the percentage to be converted in a single operation.—T. St.

Solvents for india rubber and animal fats; Preparation of — [from mineral oils]. J. B. Carper and T. G. Tulloch, London. Eng. Pat. 124,072. (Appls. 5167, 23.3.18, and 5635, 2.4.18.)

A MIXTURE of about 25% of shale oil light fractions (sp. gr. 0.7 or below) and about 75% of once distilled (to about 200° C.) coal tar oil is washed successively with sulphuric acid, caustic soda, and water, and is then distilled. The first portion of the distillate, i.e., the fraction giving on distillation 90% at about 160° C., is suitable for a light rubber solvent; a further portion of the distillate, i.e., the fraction yielding 90% at 190° C., may be used as a heavy rubber solvent. The first distillate is also useful as a solvent for animal fats.—L. A. C.

Petroleum and other hydrocarbon oils; Apparatus for vaporisation and distillation of —. G. A. Humason, Assignor to J. W. Parker, Houston, Tex. U.S. Pat. 1,291,899, 21.1.19. Appl., 1.7.18.

A SEPARATOR attached to a still is provided with condensing chambers and a vapour-outlet pipe leading to a condenser. Means are provided whereby the distillates from any of the separator chambers are automatically mixed with the liquid from the condenser to form a liquid of a desired specific gravity.—L. A. C.

Petroleum derivatives; Apparatus for treating —. H. B. Setzler, Coffeyville, Kans., Assignor to The National Refining Co., Cleveland, Ohio. U.S. Pat. 1,292,966, 28.1.19. Appl., 29.10.15.

A HORIZONTAL cylindrical pressure-still is fitted with an internal rotating scraper in the form of a helical strip of approximately the same length and

diameter as that of the still. The scraper is attached loosely to driving arms fitted to a shaft placed eccentrically with respect to the axis of the still and thus bears continually upon the bottom of the still.—L. A. C.

Crude-oil residuum; Method of and apparatus for coking —. T. E. Murray and E. B. Ricketts, New York. U.S. Pat. 1,293,866, 11.2.19. Appl., 20.11.17.

A CURRENT of hot gas is passed over a thin layer of crude oil residuum flowing over the inner surface of a chamber; volatile portions of the residuum are evaporated and coke is deposited on the surface.—L. A. C.

Lubricating-grease; Process for making —. F. B. Mason, Bayonne, N.J. U.S. Pat. 1,294,136, 11.2.19. Appl., 13.7.17.

A MIXTURE of fatty acid, mineral oil, and hydrated "lime flour" is heated below 100° C. without the addition of water.—L. A. C.

Oils containing paraffin; Double-tube cooler for —. R. Neumann, Brünn, Austria. Ger. Pat. 399,850, 21.2.18. Int. Conv., 9.8.17.

THE apparatus consists of a battery of double tubes, oil passing through the inner tubes and cooling liquid through the outer; the cooling liquid is vaporised by the heat absorbed from the oil. The outer tubes are so connected by overflows for the cooling liquid that the latter, which enters through a single valve, largely or completely surrounds the inner tubes whilst leaving a space for the vapour formed.—T. St.

Coke ovens and the like; Burner nozzles for —. L. Wilputte, New Rochelle, N.Y., U.S.A. Eng. Pat. 119,464, 13.9.18. (Appl. 14,953/18.) Int. Conv., 23.9.17.

Combustion of gas; Process and apparatus for the —. H. R. Maxon, Muncie, Ind., U.S.A. Eng. Pat. 124,052, 14.3.18. (Appl. 4549/18.)

SEE U.S. Pat. 1,291,589 of 1919; this J., 1919, 245 A.

Ammonium sulphate. U.S. Pats. 1,291,729—30. See VII.

Hydrogen manufacture. Ger. Pat. 309,549. See VII.

Reclaiming asphaltic waste. U.S. Pat. 1,290,954. See IX.

Roofing felts. U.S. Pats. 1,293,185—6. See IX.

Fibre and asphalt from roofing-scrap. U.S. Pat. 1,293,298. See IX.

Soaps containing hydrocarbons. Ger. Pat. 309,574. See XII.

[Gas] testing apparatus. U.S. Pat. 1,282,409. See XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Distillation of albumin. Pictet and Cramer. See XIX A.

Distillation of wood of conifers. Huerre. See XX.

PATENTS.

Incandescence arc-lamp. P. K. Devers, jun., Lynn, Mass., Assignor to General Electric Co. U.S. Pat. 1,290,930, 14.1.19. Appl., 6.3.16.

TUNGSTEN electrodes, separated by a gap of "about the same order of magnitude as the electrodes," are used, and the lamp bulb is filled with a gas at approximately atmospheric pressure at the operating temperature, so as to suppress disintegration of the electrodes, the gas being inert to tungsten at high temperatures. A heater wire of refractory metal is coiled about the arc gap to render the gas between the electrodes conductive to the current, one terminal of the wire being connected to one of the electrodes. The necessary voltage for producing an arc is supplied to the electrodes, whilst they are at a temperature at which the electron emission is appreciable.—B. N.

Carburising material. U.S. Pat. 1,292,044. See X.

Lecoglucosan. Eng. Pat. 121,725. See XVII.

III.—TAR AND TAR PRODUCTS.

Lignite tar; New proposal for the treatment of —. E. Erdmann. Braunkohle, 1918, 17, 425. J. Gasbeleucht., 1919, 62, 119—120.

EXISTING processes for working up lignite tars in Central Germany yield principally fuel oil and small quantities only of the more valuable lubricating oils and solid paraffin. The author considers as technically imperfect and wasteful of time, labour, and material, the repeated fractional distillation at high temperatures and the removal of unsaturated compounds by the normal acid and alkali washing. Solid paraffins are very sparingly soluble in cold acetone—1 gm. of hard paraffin is dissolved by 11,000 grms. and 1 gm. of soft paraffin by 2146 grms. of acetone at 2° C. This permits of the almost quantitative removal of paraffin from tars and tar oils accompanied by the small quantity of residual bitumen (montan wax) by the addition of acetone. The process can also be used for analytical purposes. Two volumes of acetone is mixed with one volume of warm tar, the solution is cooled to 0° C., and pressed to separate the hard paraffin in a saleable condition. Further cooling to -20° C. yields a softer paraffin. On distilling the acetone extract under normal pressure after removal of the acetone, oil commences to distil at 250° C. with evolution of gas which increases as the temperature rises and is somewhat violent at 400° C. when the distillation ends. The gas has the composition:—C₂H₄, 11%, CO 11%, CH₄, 77%. The evolution of gas was not due to the decomposition of phenols nor of bitumen as had been supposed, but rather to the breakdown of some of the heavy mineral oil constituents. On distilling the acetone extract under 4 mm. of mercury pressure about one-half passed over at 144° C., leaving a viscous residue which by distillation under normal pressure is broken down yielding fuel oil and permanent gas. Commercially it is better to distil the acetone extract in superheated steam and the residual viscous mass forms a valuable lubricating oil, the yield of which is increased from a few per

cent. in the normal process up to 30% on the tar and even 50% on producer tars. The lubricating oil contains 235% of sulphur with which the high viscosity is believed to be connected.—H. J. H.

Coumarone resins. Marcussou. See XIII.

PATENTS.

Sulphonic acids; Method of isolating — in the form of salts from the products obtained on sulphonating carbon compounds. A. Lapworth and H. N. Morris, Manchester. Eng. Pat. 14402/15. Appl., 6.4.16.

READILY soluble sulphates of certain di- and tri-valent metals, such as magnesium, aluminium, iron, cobalt, nickel, cadmium, and zinc, are used to isolate sulphonic acids from the crude product of sulphonation in the form of salts, which are soluble in water to the extent of 5 to 25% but are more sparingly soluble in dilute sulphuric acid of 30–50% strength. The crude product is treated with not more than 5% in excess of the theoretical quantity of the sulphate of the metal in question, either wholly or partly in aqueous solution, and after cooling, the precipitated sulphonic acid salt is filtered off and washed with a prescribed quantity of a cold saturated solution of the pure salt from a previous operation. The filtrate and washings contain only sulphuric acid and a few per cent. of metallic salts, and the latter together with a requisite proportion of the filtrate are neutralised with metallic oxide or carbonate so as to provide a solution saturated with sulpho-salt, and containing the amount of metallic sulphate required for a repetition of the operation.

—G. F. M.

Toluene sulphonic acids; Process for the manufacture of —. J. A. Ambler, Norwich, Conn., and H. D. Gibbs, San Francisco, Cal. U.S. Pat. 1,292,950, 23.1.19. Appl., 26.1.18.

A CONTINUOUS process for the production of toluene sulphonic acids consists in bringing toluene vapour in contact with a descending current of sulphuric acid.—L. A. C.

Anthraquinone; Method of purifying commercial —. H. F. Lewis, Urbana, Ill., and H. D. Gibbs, San Francisco, Cal. U.S. Pat. 1,293,610, 4.2.19. Appl., 26.1.18.

COMMERCIAL anthraquinone in the solid state is reduced by the action of finely divided iron and a hot alkaline solution, the resulting solution is filtered, and anthraquinone of a high degree of purity is recovered by subsequent re-oxidation.

—G. F. M.

Treating hydrocarbon oils. Eng. Pat. 10,981. See IIA.

Solvents. Eng. Pat. 124,072. See IIA.

Trinitro compound from phenol. U.S. Pat. 1,292,266. See XXII.

IV.—COLOURING MATTERS AND DYES.

Citronines. T. Maki. Kōgyō-Kwagaku Zasshi (J. Chem. Ind. Tokyo), 1918, 21, 1199—1224, 1919, 22, 1—27.

ORANGE-IV, prepared by diazotising sulphanilic acid and coupling with diphenylamine, yields various Citronines when nitrated. These dyes are mixtures of nitrated Orange-IV and nitrodiphenyl-

amines. The best product, "Citronine-IV," is obtained by shaking Orange-IV with dilute nitric acid (sp. gr. 1.226) at 15°–17° C., for 20 hours. It is a dark brown powder, dyeing silk and wool a beautiful bright yellow, fast to reagents with the exception of stannous chloride. Another dye, Citronine-VII, is obtained when nitric acid of sp. gr. 1.377 is used. Fuming nitric acid entirely ruptures Orange-IV and gives hexanitrodiphenylamine and *p*-phenolsulphonic acid. When Orange-IV is heated with aniline hydrochloride and aniline (proportions, 1:1:2), at 100° C. for 2 hours and then to 180° C., Induline is formed. Citronines or polynitrodiphenylamines oxidise aniline or the toluidines when heated at 120°–130° C. and finally at 180° C., Magentas being formed. Similarly, with dimethylaniline they give a dye similar to Methyl Violet, and with α -naphthylamine a substance resembling Magdala Red.—J. C. W.

Adsorption compounds [of dyestuffs]. II. R. Haller. Kolloid-Zeits., 1919, 24, 56–66. (See this J., 1918, 411 A.)

The adsorption compounds produced by the addition of a 1% solution of Brilliant Green to 0.5 gm. of the following substances dissolved in 50 c.c. of water have been isolated and characterised: Metanitroparatoluidine Red, Metanitroanisidine Red, Paranitro-orthoanisidine Red, Sudan G, Sudan I, Paranitriline Red, Alizarin Yellow GGW, Fast Orange O, Brilliant Orange, Chromotrope 2R, Ponceau 2G, and *p*-nitrobenzenazonaphtholsulphonic acid. The effects produced by dyeing wool and cotton in the presence of tannic acid are noted.—J. F. S.

PATENTS.

Indoxyl, its homologues, and their derivatives; Manufacture of —. E. A. Boucart, Assignor to Comp. Nationale de Matières Colorantes et de Produits Chimiques, Paris. U.S. Pat. 1,293,680, 11.2.19. Appl., 1.8.16. Renewed 10.10.18.

See Eng. Pat. 101,316 of 1916; this J., 1916, 1056.

Picric acid. Eng. Pat. 9962. See XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cellulose and artificial silk textiles. A. Kramer. Monatschr. Textilind., 1918, 33, 81–82. Chem. Zentr., 1919, 90, II., 118–119.

CELLULON yarns are manufactured by the Türk wet-spinning process by rolling and twisting narrow ribbons of fibrous pulp which are formed on cylinder moulds from suspensions of cellulose. They are superior in tensile strength to yarns made from paper and show a smaller loss in spinning; they are very resistant to washing and boiling and behave better than paper yarns in the bleaching and dyeing baths. Cellulose yarn, on account of its high strength, serves as a substitute for hemp for the manufacture of machine belting, girths, hose-pipes, and twine. "Staple fibre" is a product made from cellulose solutions like artificial silk. The cellulose solution is pressed through fine sieve-like spinnerets and, as soon as the threads are solidified, they are chopped up into pieces 4–5 cm. long and dried. These fibres are of the length of certain natural textile fibres, and the spun material is somewhat similar to wool; the fabrics have the feel of woollen fabrics and at the same

time a high lustre. Fabrics woven from a mixture of "staple fibre" with wool or cotton are extremely strong and can be washed. The dyeing of "staple fibre" presents no difficulties.—J. F. B.

Paper textiles and yarns; Processes for making — soft and waterproof. E. O. Rasser. Papierfab., 1918, 16, 621–625, 645–647. Chem. Zentr., 1919, 90, II., 114–115.

THE softness of the yarn stands in relationship to its roundness, smoothness, and moisture content. The yarn leaves the spinning discs with a moisture content of 39%, and the spinning machine at 20–25%. In the weaving sheds it is worked with not more than 15% of moisture. Moistening on the slitting machine, or by dipping the rolls, or in special chambers has not answered so well as damping on the spinning machine. In selecting a chemical softening agent, preference is given to those which do not decrease the tensile strength and which prevent the development of moulds. Mixtures of glycerin with a little carbolic acid are used; glycerin residues are also suitable. Alum is employed, but owing to its acid reaction it is not quite free from objection. For testing softened yarns a number of instruments have been devised, but their indications would not appear to be so accurate as the determination of the tensile stretch. A comparison of the elongation values affords a measure of the softness of the paper yarn. Strips cut from the machine direction of the paper have a smaller elongation than those cut from across the web; the mean of the two values is therefore taken. For softening paper yarn textiles, soaps are employed or, alternatively, the textiles are boiled for a long time in a weak solution of sodium carbonate, sometimes with the addition of sodium sulphide. For the preparation of soft, water-resistant fabrics, mixtures of casein-lime with soap and aluminium acetate are employed, also mixtures of sodium carbonate, lithopone, and calcined lime with alum, and mixtures of hydrogen peroxide, ammonia, soap, lime, talc, and aluminium acetate. A waterproofing composition is made from a solution of parchment waste in cuprammonium. The fabric impregnated with this solution is freed from copper by steeping in a solution of ammonium sulphate and aluminium acetate.—J. F. B.

Book papers; Manufacture of — from wood fibres. A. O. Bowness. Pulp and Paper Mag., 1919, 17, 195–198.

WOOD pulp intended for book papers should be very well boiled so that it can be bleached with a minimum quantity of bleaching powder, in order that the cellulose fibre may retain its strength and flexibility. A mixture of equal parts of sulphite and soda pulps makes a suitable blend, and if mechanical pulp be used, one ground on medium sharp stones at about 60 lb. pressure should be selected. The beating should be accomplished in about two hours with the roll rubbing rather than cutting; the beaters are preferably furnished rather thickly, so that whilst the fibres are well hammered out, their length is preserved. Any reduction in the length of the fibres, required to give a close pliable sheet with even surface, should be effected in the refiner, preferably of the Marshall type. The best arrangement of the chests is to have two large chests with the refiner placed between them. The beaters are emptied into one of these and the stuff is pumped through the refiner into the other. From this it is pumped into a smaller chest which supplies the mixing box of the machine by gravity. Rotary strainers are by far the best for wood fibre stock. On the machine, the best results for book papers are

obtained with a wire 38–40 ft. long. The shake of the wire must be smooth and not too long in the stroke. To prevent cockling the press-felts, especially that of the second press, must be kept clean so that the moisture in the paper is not unevenly distributed as it passes to the dryers. Strict attention must be paid to the draws to avoid uneven stretching at the edges. Smoothing rolls between two stacks of dryers are advantageous.—J. F. B.

Clays for use in paper-making. R. B. Roe. J. Amer. Ceram. Soc., 1919, 2, 69–73.

The value of a clay used in paper-making for filling the interstices between the fibres depends chiefly on its whiteness—which may be increased by the addition of a little blue pigment—the absence of grittiness, as judged by an examination of the residue left after washing the clay on a 200-mesh sieve, and on the amount of clay which is retained by a normal paper during manufacture. American clays are inferior to English ones for paper making.—A. B. S.

Coumarone resins. Marcussou. See XIII.

Transformations of nitrocellulose. Angell. See XXII.

PATENTS.

Textile belting. E. C. R. Marks, London. From Aktieselskabet Roulunds Fabriker, Odense, Denmark. Eng. Pat. 123,502, 25.10.18. (Appl. 17,469/18.)

In order to eliminate hygroscopic matters from raw textile fabrics and to ensure that the impregnating substance will completely displace these matters, the textile belts are placed in a closed vessel in which a vacuum is produced, and the impregnating substance dissolved in a volatile hydrocarbon is admitted, preferably under pressure. After impregnation and removing the impregnating liquid, steam is admitted to the vessel and the solvent is evaporated. Under the action of the steam, the hygroscopic constituents of the textile exude and their place is filled by the impregnating fluid. A volatile solvent of high boiling point, e.g. "mineral turpentine," is advantageously employed to keep the impregnating material fluid during steaming. Finally the vapours and moisture are removed by heating the belts under reduced pressure.—J. F. B.

Textile and other fabrics; Apparatus for coating — J. Huebner, Cheadle Hulme. Eng. Pat. 123,551, 26.1.18. (Appl. 1519/18.)

The fabric is passed between two rollers, the upper roller acting as the coating roller and having a surface stippled, engraved, or etched with a suitable design or with minute longitudinal, spiral or circumferential grooves. An adjustable "doctor" is fitted to the coating roller, adapted to form a containing trough for the rubber or cellulose plastic material to be applied to the fabric. As the roller passes the "doctor" a uniform film of plastic material adheres to the roll, forming a coating the thickness of which is determined by the adjustment of the blade. This coating is then transferred to the fabric as it passes between the two rollers.—J. F. B.

Wool, hides, flax, jute, etc.: Recovering grease and the like from water which has been used in scouring or washing — or from magma obtained from such water. W. Kelsey, Bradford. Eng. Pat. 123,848, 14.3.18. (Appl. 4516/18.)

The greasy water is agitated and strained by passing it through a filter of broken glass, iron

filings, pieces of tin, etc. supported in the upper part of a tank in which the strained liquid is agitated and caused to deposit sand or other matters in suspension. The liquor passes through perforations in the side of this tank into a tank divided transversely by a number of partitions extending alternately from the top and from the bottom of the tank in such a way as to form a zigzag passage for the liquid through the compartments. Outlets are provided in the tops of the compartments for the removal of the grease as it rises above the water in the succeeding compartments. The grease passes off into a trough, whence it is forced into an apparatus similar to that used for separating cream from milk. The watery liquid is drawn off by a pipe leading from near the bottom of the last compartment and may then be treated with acid to liberate the fatty acids and remaining grease, these being separated in an apparatus similar to the first.—J. F. B.

Drying process and apparatus for tentering and other machines. F. P. Boland, Providence, R.I. U.S. Pat. 1,294,035, 11.2.19. Appl., 19.4.17.

The goods to be dried are passed into a heated chest. Air is forced through a pipe, from a chamber situated beneath the chest, to one side of the goods, through the goods in a direction at right angles to the direction of travel, drawn off at the opposite side, and returned for re-application.—S. S. A.

Hemp; Process for preparing — by warm water retting. C. Kuhnaw, Wilhelminenhof. Ger. Pat. 291,326, 12.3.15.

BEFORE the raw material is subjected to retting by warm water, it is broken and freed as far as possible from particles of wood, then dried and further treated by breaking and shaking. The preliminary breaking and scutching has the effect of leaving only one-fourth of the original dry material to pass through the retting process; this is performed at about 30° C.—J. F. B.

Celluloses; Process of treating [dissolving] —. The Manchester Oxide Co., Ltd., R. H. Clayton, J. Huebner, and H. E. Williams, Manchester. Eng. Pat. 123,764. (Appls. 17,817, 1.12.17, and 10,567, 27.6.18.)

SOLUTIONS and viscous gelatinous masses are prepared from cellulose by the action of certain thiocyanates, such as calcium, manganese, strontium, or lithium thiocyanates. In other cases satisfactory results are obtained by combining sparingly soluble thiocyanates with aqueous solutions of soluble thiocyanates. Examples: 4 grms. of dry cellulose is treated with 100 c.c. of calcium thiocyanate solution of sp. gr. 1.38. After heating at 100° C. with agitation for one hour, the temperature is raised to 120° C. and maintained at that until the cellulose is dissolved. Alternatively, a solution containing 70 grms. of sodium thiocyanate and 70 grms. of mercuric thiocyanate in 100 c.c. may be used. Part of the thiocyanate may be replaced by other salts, such as calcium chloride, for instance, a mixture of 30 c.c. of a solution containing 86 grms. of calcium chloride per 100 c.c. and 70 c.c. of a solution containing 76 grms. of calcium thiocyanate per 100 c.c. may be used. The addition of 4% of acetic acid is advantageous.—J. F. B.

Pyroxylin compounds; Process of making —. W. G. Lindsay, Newark, N.J., Assignor to The Celluloid Co. U.S. Pat. 1,292,819, 28.1.19. Appl., 15.6.17.

Hydrous pyroxylin is mixed with benzyl benzoate and the water is removed by pressing.—S. S. A.

Dental filling [from celluloid] and process of making same. H. A. Black, Topeka, Kans. U.S. Pat. 1,294,355, 11.2.19. Appl., 27.4.18.

A MIXTURE of one part by weight of nitrocellulose (celluloid), $\frac{1}{2}$ part of a saturated solution of gum arabic in chloroform, and $\frac{1}{4}$ part of powdered silica is dried in the form of a thin sheet, and then powdered.—L. A. C.

Sulphite-boiler plant. J. K. Ruths, Djursholm, Assignor to Aktiebolaget Vaporackumulator, Stockholm, Sweden. U.S. Pat. 1,292,080, 21.1.19. Appl., 24.2.17.

A STEAM accumulator is interposed between, and connected respectively to a steam generator and a sulphite boiler. The flow of steam is controlled in its passage from the generator to the accumulator.—S. S. A.

Cellulose digesters; Apparatus for charging —. A. Staempfli, Bingen. Ger. Pat. 309,679, 15.3.18.

THE particles of the raw charge before filling into the digester are so heavily squeezed together that no elastic swelling up again to the original bulk takes place and the charging of the digester simply consists in running in the compressed particles. The reduction in space occupied may be as much as one-third of the original volume and depends on the pressure employed and the moisture-content of the wood.—J. F. B.

Wood cellulose and mechanical pulp; Process for separating the resin from —. H. Wandrowsky, Berlin. Ger. Pat. 309,630, 5.5.18.

THE pulp is treated during the beating with salts which react by double decomposition to give sparingly soluble products. For instance, the pulp is treated in the hollander with calcium or magnesium chloride and an equivalent quantity of sodium oxalate is then added. Calcium or magnesium oxalate is formed and the resin acid remains in suspension in a finely divided state. It may be precipitated on the fibre by the addition of alum and so play a useful part in the sizing of the paper.—J. F. B.

Beating engines; Hollander —. H. Anderson, St. Annes-on-Sea, G. E. Anderson and T. Wilson, Bury. Eng. Pat. 123,584, 27.2.18. (Appl. 3474/18.)

THE hollander is designed with the roll, plate, and plate-box in a relatively elevated position, so that the proportion of the roll immersed in the stuff is reduced. The bottom of the trough is inclined upwards to the roll and the inclination downwards from the back fall is continued gradually right round the trough to the lowest point. An emptying device is provided whereby fresh water or back water is injected through holes in the floor of the back fall, so that the stuff is diluted from below and flows easily down the incline to the discharge orifice. These apertures are covered with an apron when not in use, so that stuff cannot lodge therein during the beating. The sides of the trough adjacent to the ends of the roll are cut away and fitted with removable side plates, so that hoops may be fitted on the roll while it is in position in the engine. End-shields or spinners are provided on the ends of the roll shaft and are constructed with two flanges embracing the edges of the side plates of the trough to prevent leakage.—J. F. B.

Paper; Manufacture of parchmentised or like —. W. Dagnall, Hampton Wick. Eng. Pat. 123,594, 28.2.18. (Appl. 3598/18.)

PAPER is treated successively in two baths of sulphuric acid of different concentrations, the first

bath having sp. gr. 1.700–1.800 at 15.5° C. After passing through this bath the paper is squeezed between rollers and immediately enters the second bath, which has sp. gr. 1.200–1.400. For certain kinds of paper the sulphuric acid may be mixed with sulphurous acid, so that the sp. gr. of the first bath is reduced from 1.800 to 1.700–1.750. During the operation the sulphuric acid baths are kept cool, so that the temperature does not rise above 15.5° C. After leaving the second sulphuric acid bath the paper is squeezed, led between water sprays and thoroughly washed; it is then passed through a bath of alkali and again washed and squeezed; lastly, it is led through a bath containing a softening liquid, squeezed, dried, and calendered.—J. F. B.

Paper; Surfacing —. G. H. Parks, Glen Falls, N.Y., Assignor to International Paper Co., New York. U.S. Pat. 1,291,620, 14.1.19. Appl., 9.3.14.

A SOFT surface glaze is imparted to both sides of a web of paper by condensing moisture on the periphery of a cooled roller, rolling the moisture with a light tension-roller pressure into and upon one side of the paper and repeating the same operation with another roller, in advance of the first, against the other side of the paper. The moistened paper is then ironed at a temperature higher than that of its moistened surfaces and is finally finished by calendering.—J. F. B.

Stencil-paper compounds and methods for making them. E. Thomas, New York. U.S. Pat. 1,293,983, 11.2.19. Appl., 2.7.12.

YOSHINO or other paper is coated with a mixture containing a soap, e.g., aluminium oleate, and a wax, e.g., ceresin, the soap being softer at the ordinary temperature, but having a higher melting point than the wax. This coating is faced with a layer of stearic acid. The aluminium oleate is prepared for application by making a strong hot mixture of it with a solvent, and then thinning it by the addition of more solvent.—S. S. A.

Pulp and paper from garbage; Manufacture of —. J. F. and H. F. J. Puttaert, San Francisco, Cal. U.S. Pat. 1,294,163, 11.2.19. Appl., 12.12.16.

A FIBROUS pulp is obtained from garbage by removing hard unsuitable material, crushing the remaining substance, expressing a portion of the water, and boiling the residue with alkaline reagents.—S. S. A.

Paper textiles; Process for coating — with nitrocellulose solutions. A. Lehner, Berlin. Ger. Pat. 308,615, 6.11.17.

THE fabric, before coating, is filled with a paste composed of an indifferent powdered material and a liquid which in small quantities is miscible with the nitrocellulose solution but in larger quantities acts as a precipitating agent, for instance, xylene, heavy petroleum spirit, toluene or, in some cases, water. The nitrocellulose solution is spread upon the prepared fabric and dried, and the powder, which has also become dry, is removed from the fabric. The paper fabric coated in this manner is soft and pliable, and the coating adheres firmly without stiffening the fabric.—J. F. B.

Paper yarn fabrics; Manufacture of a strong, pliable and water-resistant sheet material from —. E. Pohlmeier, Erfurt. Ger. Pat. 309,516, 24.4.18.

ONE or several layers of paper yarn fabric impregnated with an adhesive are covered with paper on

both sides and then treated with tanning agents. In the hardening process, the dissolved adhesive is retained by the layers of paper and is subsequently dried between them.—J. F. B.

Paper, textiles, etc.; Process for sizing, water-proofing and finishing —. W. Schmidt, Elberfeld, and E. Heuser, Darmstadt. Ger. Pat. 309,680, 4.1.18. Addition to Ger. Pat. 296,124.

Wood-, lignite- or coal-tar soap in the form of a solution is applied to the web of paper or textile and then allowed to dry. It is not necessary to decompose the tar soap nor to treat it with formaldehyde; after drying, the treated paper has the properties and the colour of artificial leather.—J. F. B.

Carbon-paper. S. Hattori, Tokyo. U.S. Pat. 1,292,404, 21.1.19. Appl., 26.4.18.

PAPER is coated with a mixture containing a barium soap (e.g. barium stearate), together with an oily material and a colouring matter.—S. S. A.

Paper and boards; Process for waterproofing —. H. Wandrowsky, Berlin. Ger. Pat. 309,565, 21.4.18.

ANIMAL, vegetable, or mineral non-drying oils are mixed with finely powdered, solid, water-repellent substances and the paper or board is impregnated with the mixture. Suitable water-repellent substances are: graphite, soot, talc, and "bärlapp" seeds. The powder penetrates together with the oil into the pores of the paper and after the oil has been absorbed by the fibres the pores are stopped up with the solid matters.—J. F. B.

Paper; Manufacture of hard-sized —. O. Ruff, Breslau. Ger. Pat. 309,999, 8.12.17.

THE paper pulp, or a portion of it, is subjected to a putrefactive or fermentation process before it is converted into paper and the paper prepared from this material is strongly heated. The heating process is stronger and of longer duration than is customary on the paper machine and produces a true sizing. For example, wood pulp is mixed with some of the putrefied mass and allowed to stand for about 14 days at 30°–40° C. The paper prepared from this material is led over a drying cylinder heated by steam at 2.5 atmos. pressure and is reeled upon a roll in close contact with the cylinder so that the temperature of the paper reaches 110°–120° C. After about 2 hours the paper is re-reeled with simultaneous damping.—J. F. B.

Wooden receptacle; Coated —. G. T. Bloom, Magnolia, N.J. U.S. Pat. 1,291,696, 14.1.19. Appl., 13.12.16.

THE inner surface of a wooden receptacle is coated with a partly dried elastic coating consisting entirely of concentrated waste sulphite liquor or sulphite pitch of approximately 1:18 sp. gr. and having an unneutralised acid reaction.—J. F. B.

Adhesive [from sulphite-cellulose waste lye], and process of making same. J. S. Robeson, Pennington, N.J. U.S. Pat. 1,292,068, 21.1.19. Appl., 21.2.16.

A NON-ALKALINE, alkali resinat is treated with concentrated sulphite waste liquor.—S. S. A.

Reclaiming asphaltic waste. U.S. Pat. 1,290,954. See IX.

Roofing felts, etc. U.S. Pats. 1,293,185–6. See IX.

Fibre and asphalt from roofing-scrap. U.S. Pat. 1,293,293. See IX.

Fat etc. from cellulosic materials. Ger. Pat. 309,555. See XII.

Balloon fabric. Eng. Pat. 5915. See XIV.

Adhesive. Ger. Pat. 309,650. See XVII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Absorption compounds [of dyes]. Haller. See IV.

PATENTS.

Dyeing-machine. M. Nagle, Brooklyn, N.Y. U.S. Pat. 1,293,514, 4.2.19. Appl., 17.8.16.

A SWINGING and displacing motion is imparted to yarn suspended in a vat, by means of a shaft provided with yarn-retaining plates, between which is fixed an elongated web. The axis of the shaft is within the cross-section of the web and is relatively nearer to one longitudinal edge than the other.—S. S. A.

Ice colours on the fibre; Process for producing —. A. Porai-Koschitz, Petrograd. Ger. Pat. 308,903, 17.12.13.

INSTEAD of the usual β -naphthol, β -naphthol sulphide is employed, either alone or in conjunction with other phenols or their derivatives, for printing and dyeing textile fibres by the single or multiple bath process. β -Naphthol sulphide (2,2'-dihydroxy-1,1'-dinaphthyl sulphide) possesses the advantage of being non-volatile during drying and steaming; it forms sparingly soluble salts with the heavy metals and is far more resistant to the action of air than the β -naphthol ordinarily used for padding.—J. F. B.

Adhesive. Ger. Pat. 309,650. See XVII.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; Formation of — at high temperatures. E. Briner. Helv. Chim. Acta, 1919, 2, 162–166.

A DISCUSSION of Maxted's recent work (this J. 1918, 232 r, 368 A). It is suggested that in order to explain the increased proportion of ammonia in the nitrogen-hydrogen equilibrium at temperatures above 2000° Abs. such factors as the dissociation of the elementary molecules into atoms must be considered. (See further J. Chem. Soc., May, 1919.)—J. C. W.

Ammonia; Determination of some physical constants of —. A. Berthoud. J. Chim. Phys., 1918, 16, 429–437.

THE density orthobars of liquid and gaseous ammonia have been determined at different temperatures from 0° C. up to the critical temperature and it is shown that ammonia follows the

law of the rectilinear diameter. The critical density of ammonia is found to be 0.2364. The surface tension of ammonia has been measured between 11° C. and 59° C. The results recorded confirm the view that ammonia is associated in the liquid state and up to the critical point.

—W. G.

Glucinum; Method of treating beryl for the extraction of —. H. Copaux. Comptes rend., 1919, 168, 610—612.

THE finely powdered mineral is heated at 850° C. for half an hour with twice its weight of sodium silicofluoride. The product, which consists of silica and the double fluorides of sodium and aluminium and sodium and glucinum, is extracted three times with boiling water. The extract is filtered and to the filtrate boiling aqueous sodium hydroxide is added in slight excess. The oxide of glucinum precipitated, along with a little alumina and silica, is dissolved in sulphuric acid, and glucinum sulphate crystallises out on concentrating the solution. In this way 90% of the glucinum in the beryl is recovered. For the estimation of glucinum in beryl, 5 grms. of the powdered mineral is treated as above with 20 grms. of sodium silicofluoride. The precipitation with sodium hydroxide is omitted and an aliquot portion (300 c.c. out of 1 litre) of the filtered aqueous extract is evaporated with sulphuric acid until white fumes appear. The residue is treated with water and an excess of ammonia is added. If the precipitate contains a noticeable quantity of iron it is redissolved in acetic acid and the iron removed by means of nitroso- β -naphthol. The filtrate is boiled and made alkaline with ammonia and the precipitate is filtered off, dried, ignited, and weighed. Any silica present is removed by treatment with hydrogen fluoride and the aluminium and glucinum are separated by Wunder and Wenger's method (this Journal, 1912, 664) by fusion with sodium carbonate.—W. G.

Tellurium sulphide. A. M. Hageman. J. Amer. Chem. Soc., 1919, 41, 329—341.

TELLURIUM disulphide, TeS_2 , is produced by passing hydrogen sulphide into an aqueous solution of tellurous acid, or into a solution of tellurium tetrachloride in an organic solvent. It is a reddish-brown powder which commences to dissociate above -20° C. Tellurium monosulphide, TeS , does not exist. Tellurium tetrachloride is soluble in benzene, toluene, methyl alcohol, ethyl alcohol, *n*-butyl alcohol, amyl alcohol, benzyl alcohol, xylene, chloroform, and ethyl acetate, sparingly soluble in light petroleum, benzaldehyde, acetone, isopropyl bromide, and carbon tetrachloride, and insoluble in carbon bisulphide. (See also J. Chem. Soc., May, 1919.)—J. F. S.

Iodine; Occurrence of — in plants. E. Winterstein. Z. physiol. Chem., 1919, 104, 54—58.

IN thirty-five phanerogams which were examined, iodine was only found to be present in beetroot, potato, celery, cabbage-lettuce, and carrot. It could not be detected in mushrooms or yellow boletus. The method of examination consisted in reducing the plant to ash after adding sodium hydroxide solution, nearly neutralising the ash with dilute sulphuric acid, filtering off the carbonaceous matter, rendering this alkaline and incinerating it in presence of potassium nitrate, neutralising with sulphuric acid, mixing the solution with the first filtrate, making the liquid feebly acid with sulphur dioxide, evaporating, drying the residue at 100° C., extracting with 95% alcohol (in which iodides are soluble), evaporating the extract, and treating the

aqueous solution of the residue with a solution of nitrosylsulphuric acid in concentrated sulphuric acid in the presence of chloroform, in which any liberated iodine dissolves to a red solution. Test experiments showed that 0.04 mgrm. of added iodine could be detected in 10 grms. of spinach by this method. Iodine could not be detected in milk, cheese, or cow's urine. (See also J. Chem. Soc., 1919, i., 190.)—H. W.

Ozone; Reagent for and method of estimating —. L. Benoist. Comptes rend., 1919, 168, 612—615.

THE fluorescence of a solution of fluorescein diluted to 1 in 1,000,000 is immediately destroyed by traces of ozone, the reaction taking place between two molecules of ozone and one of fluorescein, i.e., in the proportion of 0.3:1 by weight. It requires an enormous excess of nitrous vapours similarly to destroy the fluorescence, and the fluorescence of fluorescein at the above dilution is not destroyed by a quantity of chlorine equal to three times or of carbon dioxide equal to twenty times the weight of fluorescein. An optical arrangement is described which permits of the detection, by observation in a dark room using an intense white light in a black-walled box, of fluorescence in a solution of fluorescein at a dilution of 1 in 1,000,000,000, and thus using 3 c.c. of such a solution it is possible to detect and estimate 10^9 gram of ozone, an amount far smaller than can be detected by starch-iodide.—W. G.

Magnetic concentration of pyrrhotite. Bonardi. See X.

Reagents for bases and acids. Chauvierre. See XXIII.

PATENTS.

Nitrous gases; Method of manufacturing concentrated —. O. Jensen, Rjukan, Assignor to Norsk Hydro-Elektrisk Kvaelfstofaktieselskab, Christiania, Norway. U.S. Pat. 1,291,909, 21.1.19. Appl., 6.10.16.

DILUTE nitrous gases are absorbed by sulphuric acid of sufficient concentration to decompose the resulting nitrosylsulphuric acid when heated under dephlegmation without the addition of denitrating substances.—L. A. C.

[Nitrogen oxides suitable for making] nitric acid; Method of producing —. W. S. Landis, Assignor to F. S. Washburn, New York. U.S. Pat. 1,292,814, 28.1.19. Appl., 24.2.17.

A MIXTURE of ammonia, an excess of air, and sufficient oxygen to sustain the reaction is subjected to the action of a hot catalyst with the production of the higher oxides of nitrogen suitable for making nitric acid.—L. A. C.

Nitric acid; Process of concentrating — and apparatus for use in connection therewith. F. C. Zeisberg, Assignor to E. I. du Pont de Nemours and Co., Wilmington, Del. U.S. Pat. 1,292,948, 28.1.19. Appl., 30.6.17.

A MIXTURE containing not less than 64% of sulphuric acid and from 3 to 25% of nitric acid is injected into a concentrating tower through a distributor having a number of openings with a uniform discharge and is subjected therein to the action of a hot gaseous current. Nitric acid vapours are removed from the tower and condensed.—L. A. C.

Sulphur trioxide; Process of making — W. H. Seamon, El Paso, Tex. U.S. Pat. 1,292,098, 21.1.19. Appl., 13.7.18.

SULPHUR trioxide is produced by fusing a mixture of sodium sulphate, calcium sulphate, and silica, in the absence of a reducing environment to avoid excessive decomposition of the sulphur trioxide formed.—J. H. P.

Furnace [for calcining sodium bicarbonate]. F. R. Hill, Keeler, Assignor to W. W. Watterson, Bishop, Cal. U.S. Pat. 1,283,515, 5.11.18. Appl., 5.3.18.

THE furnace has a central outlet opening in its floor and the material under treatment, e.g., sodium bicarbonate, is charged in at the top so that it forms an annular pile sloping down towards the central opening. A burner for liquid fuel passes down into the furnace through a central opening in the crown and projects a flame outwards towards the sloping surface of the pile somewhat above the base, and the products of combustion are drawn downwards and through the central outlet to a draught flue.

Permanganates; Electrolytic production of — B. F. Lovelace, C. E. Lanning, and W. L. Judefind, Baltimore, Md. U.S. Pats. (A) 1,291,680, (B) 1,291,681, and (C) 1,291,682, 14.1.19. Appl., 21.1.18.

(A) A SOLUTION of a compound, which by hydrolysis gives an alkaline solution, is electrolysed, using an anode containing manganese and (A) silicon, (B) molybdenum, or (C) tungsten.—B. N.

Alkaline permanganates, chlorates, and hydrogen; Process for making — T. J. Brewster, New York. U.S. Pat. 1,291,751, 21.1.19. Appl., 17.10.17.

A MIXTURE of manganese oxides and a solution of a caustic alkali is evaporated to dryness and the residue is ground and calcined in the presence of air or oxygen. The product is leached with water and the solution treated with chlorine and hydrochloric acid.—L. A. C.

Ammonium sulphate; Apparatus and process for the recovery of — Ammonium-sulphate-recovery process. J. Becker, Assignor to The Koppers Co., Pittsburgh, Pa. U.S. Pats. 1,291,729 and 1,291,730, 21.1.19. Appl., 23.6.16 and 12.8.18.

AMMONIA liquor condensed from cooled and tar-free gas is distilled and at the same time a portion of the gas is reheated; the vapour and heated gas are then led together through a coil arranged in the bottom of a saturator into which the remainder of the gas is passed. The hot gases in passing through the coil cause evaporation of the liquor in the saturator and thus induce crystallisation of ammonium sulphate. On leaving the coil, the gases are separated from any condensed liquor and are also led into the liquor in the saturator.—L. A. C.

Aluminous material [alunite]; Purifying — [from silica]. C. H. MacDowell and P. R. Hershman, Chicago, Ill., Assignors to Mineral Products Corporation, New York. U.S. Pat. 1,291,979, 21.1.19. Appl., 14.9.14.

ALUNITE is heated with carbon to a temperature high enough to volatilise the silica.—L. A. C.

Radium; Recovering — H. N. McCoy, Assignor to Carnotite Reduction Co., Chicago, Ill. U.S. Pat. 1,292,341, 21.1.19. Appl., 22.10.17.

A RADIUM-BEARING mass of silicious matter containing sulphates is treated with hydrofluoric acid,

whereby most of the silicious matter is rendered soluble, whilst the admixed radium compound remains insoluble.—J. H. P.

Calcium carbide; Manufacture of — F. M. Becket, Niagara Falls, N.Y., Assignor to Union Carbide Co., New York. U.S. Pats. (A) 1,292,386 and (B) 1,292,387, 21.1.19. Appl., 10.4.16.

AGGREGATES suitable for furnacing for the production of calcium carbide are prepared by mixing with (A) lime or (B) unburned limestone, a carbonaceous material serving as a source of carbon for the carbide-forming reaction and also as a coking binder for the mass, and the whole coked.—J. H. P.

Tungsten compounds; Process of separating from substances. C. Andersen and E. H. Westling, San Francisco, Cal. U.S. Pat. 1,292,559, 23.1.19. Appl., 30.4.17.

TUNGSTEN compounds are separated from solution by adding a salt of a trivalent metal, e.g., a ferric salt, and an alkali hydroxide to the solution. The tungsten is precipitated as a tungstate of the trivalent metal.—J. H. P.

Rotary kiln [for treating glauconite]. F. Tschirner, Newark, N.J. U.S. Pat. 1,292,928, 23.1.19. Appl., 18.5.18.

AN apparatus for converting the potassium compounds of glauconite and similar substances into a water-soluble state consists of a rotary kiln provided with heating means and a number of heat-insulated receptacles arranged in a housing at the discharge end of the kiln. The receptacles can be closed against strong currents of gases to prevent volatilisation of the material therein. Each receptacle is provided with a normally closed discharge opening and a conveyor is located in proximity to the discharge opening.—J. H. P.

Glauconite and similar substances; Process of treating — F. Tschirner, Newark, N.J., Assignor to R. G. Wagner, New York. U.S. Pat. 1,292,929, 23.1.19. Appl., 13.4.17. Renewed 12.12.18.

MATERIALS, such as glauconite, containing hydrous iron potassium silicate are heated with the chloride of an alkali-forming metal in an oxidising atmosphere, in the presence of an alkali, at a temperature about 700° C. and below that necessary to produce any substantial clinkering of the mass. The mass is maintained at this temperature for a considerable time to complete the reaction under conditions to prevent volatilisation of potassium chloride.—J. H. P.

Bleaching powder; Arrangement for taking up the heat of reaction in the manufacture of — by artificial cooling. J. L. C. Eckelt, Berlin. Ger. Pat. 309,667, 14.11.17.

THE chlorinating chamber is provided with plates supporting the lime in layers, successive plates being out of vertical alignment, and cooling pipes are mounted against or in the vertical walls of the chamber through which a cooling liquid is passed from the top to the bottom in the opposite direction to the flow of gas. The greatest amount of heat is developed near the top of the chamber where the lime is introduced and the development of heat decreases as the lime becomes saturated towards the bottom.—J. F. B.

Bromine; Recovering — [from gases]. C. E. Murrell, Rockaway Beach, N.Y., Assignor to Research Corporation, New York. U.S. Pat. 1,292,016, 21.1.19. Appl., 6.6.18.

GASES containing bromine vapour are treated with ammonia to produce fumes of ammonium bromide.

which is precipitated by means of a high-tension electric discharge.—L. A. C.

Hydrogen; Process for preventing the scorifying and clogging together of the heated iron masses in the manufacture of —. W. Näher and M. Nöding, Pforzheim. Ger. Pat. 309,549, 22.1.18.

IN the manufacture of hydrogen by passing steam over heated iron, a flux is added consisting of the "ashes" produced by the working, melting or heating of metallic aluminium in the presence of air. This addition ensures that the layers of iron mass always lie loosely one over the other and can be readily discharged, without influencing the purity of the gas. The metallic aluminium contained in the ashes is oxidised by the water vapour with the production of hydrogen.—J. F. B.

Drying gases. Eng. Pat. 124,045. See I.

Titanium products. Eng. Pat. 116,266. See XIII.

Ammonium nitrate. Ger. Pat. 309,668. See XVI.

Waste acids from nitrocellulose. Ger. Pat. 309,936. See XXII.

VIII.—GLASS; CERAMICS.

Glass vessels; Permanent marking of —. J. C. Bock. J. Amer. Chem. Soc., 1919, 41, 359—361.

A thin mixture of 4 parts of copaiba balsam, 1 of clove oil and 1 of lavender oil with sufficient of one of the colours Green 728D, Blue 1079D, Brown 695D, and White enamel 1310D (Roessler and Hasslacher Chemical Co.) to make a paste which will run from a steel pen, is applied by a steel pen to the surface of clean glass or porcelain. The mark is then dried by holding above the flame, and when dry the marked place is held against the side of the flame of a Meker burner, when after blackening the mark will begin to glow a dull red. At this point the glass is cooled a little and then reheated until it again glows. In this way a smooth shiny surface is produced which cannot be removed by any ordinary cleaning.—J. F. S.

Graphite ash; Fusibility of — and its influence on the refractoriness of bond clay. M. C. Boozé. J. Amer. Ceram. Soc., 1919, 2, 65—68.

THE fusibility of graphite ash does not indicate the effect on the refractoriness of a mixture of clay and graphite used in the manufacture of crucibles etc. At the temperatures at which brass is melted, the ash of the graphite used appears to have no appreciable effect.—A. B. S.

Enamels; Relative action of acids on —. III. E. P. Poste. J. Amer. Ceram. Soc., 1919, 2, 32—43.

IN continuation of previous work (this J., 1917, 878), the author has found that acetic acid as ordinarily obtained varies too greatly in concentration to be used as a standard acid. Citric and tartaric acids are sufficiently uniform, more active, more definite in action, and the graphs representing the ratio of the loss of weight of the enamel to the concentration of the acid are such that slight variations in the concentration of the acid are of minor importance. Tartaric acid is less affected than citric acid by prolonged storage and is, for this reason, preferable. The corrosive effect of citric and tartaric acids is quite different from that of acetic acid and no simple ratio connecting them has yet been found. —A. B. S.

Refractory materials; Thermal conductivity of — at high temperatures, and of steam-pipe laggings, by means of a new method of measuring surface temperatures. W. von Rinsum. Z. Ver. dent. Ing., 1918, 62, 601—605, 639—641. Chem. Zentr., 1919, 90, 11., 94.

A THERMO-ELECTRIC apparatus for accurately measuring the surface temperature of bodies is described, and the results of measurements of the heat conductivities of different materials are given. Various refractory materials tested differed little from each other in this respect, the mean conductivity increasing with rising temperature, and having a value at 1000° C. of 0.8 to 1.2 units (Cals. per hour per metre per 1° C.). Different lagging materials also showed increasing conductivity with higher temperatures, the values at 200° C. lying between 0.06 and 0.1 unit. A hollow brick wall had a value 0.35 as against 0.78 for a solid brick wall. —T. St.

PATENTS.

Glass sheets; Process for forming —. W. G. Shaw, Creighton, Pa. U.S. Pat. 1,283,333, 29.10.18. Appl., 12.8.15. Renewed 7.3.18.

A body of molten glass is collected on a horizontal draw-bar which is then withdrawn from the furnace, and allowed to cool. The bar is subsequently reheated until the glass flows from it under the influence of gravity to form a sheet, which passes into an area of lower temperature. Tension may be applied to the sheet to supplement the force of gravity, and the thickness of the sheet may be regulated by varying the tension and the intensity of heating.

[Glass] tube manufacture. F. G. Keyes, Boston, Mass., Assignor to Cooper Hewitt Electric Co., Hoboken, N.J. U.S. Pat. 1,291,921, 21.1.19. Appl., 18.2.13.

ABOVE the crucible containing the glass or other material is a die with a circular opening through which a tube capable of gathering up a mass of the viscous material can be raised and lowered, and as the tube is raised, drawing the material with it, air is forced into its upper end, thus hollowing out the material as it is drawn up. Above the die is a container holding boiling metal surrounding the path of the tube, and an air condenser is attached to the container for condensing the vaporised metal.—L. A. C.

Ceramic tile; Antislipping —. G. N. Jeppson and C. F. Dietz, Worcester, Mass., Assignors to Norton Co. U.S. Pat. 1,292,933, 28.1.19. Appl., 29.4.18.

A COMPRESSED mixture of coarse and fine grains of a material with a hardness of 9 or more, i.e., previously fused crystalline alumina, is bonded together by a glassy fused clay material to form an antislipping tile of high tensile strength. —L. A. C.

Refractory bodies; Preparation of — from powdered refractory materials for metallurgical, chemical, and ceramic purposes. A. Desgraz, Krölpa. Ger. Pat. 309,707, 7.3.16.

CALCINED magnesite or zirconia, burnt gypsum, and iron oxides, or iron alloys or fine iron filings are mixed together, and the mixture, after being moistened with water, is formed into crucibles, muffles, etc. After they have hardened, the articles are heated to a high temperature when sulphuric acid is driven off and sintering takes place.—T. St.

Glass-furnace. A. F. Peeters, Assignor to Naaml. Vennoots. Glasfabriek Leerdam, Leerdam, Netherlands. U.S. Pat. 1,293,533, 4.2.19. Appl., 4.4.18.

SEE Eng. Pat. 110,477 of 1918; this J., 1918, 418 A.

Aluminous abrasive. Norton Co., Worcester, Mass., Assignees of L. E. Saunders and R. H. White, Niagara Falls, N.Y., U.S.A. Eng. Pat. 113,957, 7.2.18. (Appl. 2252/18.) Int. Conv., 12.2.17.

SEE U.S. Pat. 1,247,337 of 1917; this J., 1918, 31 A.

IX.—BUILDING MATERIALS.

Mortars; Compressive strength of cement-lime — F. A. Kirkpatrick and W. B. Orange. J. Amer. Ceram. Soc., 1919, 2, 44—64.

MORTARS composed of Portland cement, hydrated lime, and river sand were made of such a consistency that a sphere 2 in. diameter when dropped from a height of 2 ft. was reduced to a mass 1 in. thick. Such mortars are much stiffer than those used by masons. Cubes of the mortars were made by moulding and were stored for 28 days prior to being crushed. Substitution of hydrated lime for part of the sand in a Portland cement mortar increased the density and therefore the strength in the same manner as an increase in the proportion of cement. The substitution of flint dust had a similar but smaller effect on the strength of the mortar. The porosity and water-content did not indicate the relative strengths of these mortars, but the compressive strength was directly proportional to the product of the volume of the cement and the volume of the total solids per unit volume of mortar.

—A. B. S.

PATENTS.

Asphaltic waste products [roofing felt]; Method of reclaiming — S. M. Ford, St. Paul, Minn. U.S. Pat. 1,290,954, 14.1.19. Appl., 13.4.18.

WASTE produced in the manufacture of asphaltic felt roofing material is chilled and broken up in the chilled condition by treating it by means of knives or grinders. The broken-up material is mixed, if necessary, with fibrous and bituminous material and moulded under heat and pressure to make waterproof containers or other articles.—J. F. B.

[Roofing] felts and the like; Process of and apparatus for treating — Process of treating felts and the like. (A) R. P. Perry, Upper Montclair, N.J., and J. M. Jack, Peoria, Ill., and (B) R. P. Perry, Assignors to The Barrett Co. U.S. Pats. (A) 1,293,185 and (B) 1,293,186, 4.2.19. Appl., 29.9. and 4.10.17.

IN drying felts for roofing, paper, etc., having on at least one side a layer of fusible adherent waterproofing material, by passing the same over heated surfaces, means are provided for interposing between the felt, etc., and the drying surface (A) a film of an oily liquid or (B) a finely divided non-adherent solid (soapstone), to prevent adhesion.

—L. A. C.

Fibre and asphalt; Recovery of — from roofing-scrap. B. A. Allison, Edwardsville, Ill., Assignor to The Barber Asphalt Paving Co., Philadelphia, Pa. U.S. Pat. 1,293,293, 4.2.19. Appl., 7.10.18.

ROOFING scrap is stirred in a boiling alkaline solution, and the disintegrated product rolled into sheets.—L. A. C.

Wooden articles impregnated with formaldehyde; Process for rendering — capable of being glued with casein. Luftschiffbau Schütte-Lanz, Mannheim-Rheinau. Ger. Pat. 309,423, 24.12.16.

THE parts to be glued are treated with an alkaline oxidising agent. For instance, the wood is painted with a solution of ammonia and hydrogen peroxide; the formaldehyde is thereby destroyed in the neighbourhood of the joint and its action on the casein glue is prevented.—J. F. B.

Sintering cement etc. Ger. Pat. 309,552. See X.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Acid Bessemer process; Present American — R. S. McCaffery. Blast Furnace and Steel Plant, 1919, 7, 140—142.

THE author describes present American practice with acid Bessemer converters of 25 tons capacity, the blast pressure being 20 to 25 lb. per sq. in. and the blow lasting 10 to 15 minutes. Experiments were made to determine if the reaction whereby the manganese in the pig is eliminated as oxide is reversible and whether spitting during the latter part of the blow with certain irons could be prevented. From consideration of the heats of combustion of the carbides and silicides in the converter under the conditions of a normal blow (the temperature being between 1600° and 1650° C.) and a blow which is excessively hot (finished at 1820° C.), it is concluded that in the latter the manganese carbide remains in the molten metal after the iron and manganese silicides have been oxidised and increases the basicity of the slag by its reducing action on silica and magnetic iron oxide, thus rendering the slag more infusible which results in the spitting phenomena. The elimination of the manganese as oxide is not reversible—even when finished at 1820° C. the manganese was frequently completely oxidised. In the blows in which there was residual manganese, it was due to the presence of carbide owing to the early and middle parts of the blow being too hot. Spitting was prevented by temperature control, i.e., steaming during the silicon blow. It was also found that the temperature during the carbon blow rose rapidly, due to the carbon monoxide being burnt in the vessel to carbon dioxide. To overcome this a new converter bottom was designed, the number of tuyères being increased and their distribution changed. Comparative blows with the old and the new style bottoms showed an increase in converter capacity of 45% with an actual saving in blowing power.—T. H. Bu.

Manganese alloys in open-hearth practice. S. L. Hoyt. Amer. Inst. Min. Eng., Feb., 1919. Blast Furnace and Steel Plant, 1919, 7, 142—146.

THE following is a summary of the results of an investigation made by the Manganese Section of the War Minerals Investigation, U.S. Bureau of Mines, on the utilisation of domestic alloys. The use of molten spiegel mixture for recarburisation and deoxidising appears to be limited to the manufacture of steels with more than 0.3% of carbon. Its advantages compared with ferromanganese are discussed. At some plants the practice of melting and refining so as to secure a high residual content of manganese, e.g., 0.25 to 0.30% for a final carbon content of 0.10% has been developed. The finishing temperature is kept high and the slag high in manganese and lime. The high manganese content of the charge is secured by using a pig iron with 2 to

3% Mn and low phosphorus content, and the temperature is raised so that finally the carbon is eliminated more quickly than the manganese. There is no advantage in decreased consumption of manganese but only in the form it is added. The use of manganese-silicon alloys depends on the amount of silicon that can be tolerated in the finished ingot. They find application in forging steel, high-carbon steel, and castings where the silicon content can be between 0.2 and 0.35%. In acid practice the use of manganese-silicon alloys is a subject of controversy, but the alloys are thought to give better separation of insoluble products and more powerful reduction. With regard to the percentage recovery of manganese when added as silico-manganese or as ferromanganese plus ferrosilicon, an examination of comparative heats was made. Given manganese and silicon contents of the finished steel were obtained with smaller amounts of manganese and silicon when using Mn-Si alloys and a more uniform product was obtained. The alloys could be substituted at once in acid practice using silicon spiegel with the correct Mn-Si ratio. In basic open-hearth practice the information is meagre, but the alloys should be satisfactory. Two good shell heats are quoted. In one the proportion of manganese recovered was 77.5% and of silicon 65.1%.

—T. H. Bu.

Steel; "Flaky" and "woody" — F. Giolitti. Chem. and Met. Eng., 1919, 20, 271—273.

"FLAKY" and "woody" structures in steel are not formed as cracks in the ingot, but originate as inter-crystalline cracks, probably intensified by inclusions and segregations. Phosphorus and sulphur should be kept to a minimum and the materials charged into the furnace should be practically free from iron oxide (scale and rust). At the Ansaldo works (Italy) open-hearth steel is made from a high grade of pure puddled iron together with a proportion of electric furnace pig, and extreme care is taken to prevent superficial oxidation during melting. The slag covering consists only of silica combined with the fluxed impurities in the original iron and is very thin. Hot pouring is recommended. Chromium steel, made from pure materials under reducing conditions, will never develop flakes either during casting or subsequent forging of the ingot. On the other hand metal properly made will develop "woody" structure if only a few kilograms of scale are thrown into the furnace some time before tapping. It is suggested that the presence of ferrite near a slag inclusion is due to an establishment of equilibrium as represented by the equation, $3\text{Fe} + 2\text{CO} \rightleftharpoons \text{Fe}_3\text{C} + \text{CO}_2$. A similar equilibrium condition of an oxidising slag may change with changing temperature in such a way that an excess of carbon dioxide is transferred to the metal, thus disturbing the equilibrium with the production of a zone of decarburised iron somewhat supersaturated with carbon monoxide as well. On working, the ferrite flattens out into a thin sheet, and if the piece is strained beyond the elastic limit, the weaker ferrite is fractured. Heating to 1000° C. for 12—18 hours in a reducing atmosphere (largely to prevent surface oxidation) will allow an equilibrium to be re-established in defective metal, and a "woody" or "flaky" structure may be cured by suitable heat-treatment.—C. A. K.

Iron; Corrosion of — P. Agostini. Annali Chim. Appl., 1919, 11, 40—85.

A résumé of the various theories which have been advanced to explain rust-formation and of papers by different authors dealing with the influence of various agents on the phenomenon (compare Friend, "The Corrosion of Iron and Steel," London, 1911; Williams, this J., 1901, 44, 127; Stead and Wigham,

this J., 1901, 995; Whitney, this J., 1903, 799; Jouve, this J., 1903, 1086; Diegel, this J., 1903, 1246; Dunstan, Jowett and Goulding, this J., 1905, 1235; Matignon, this J., 1918, 375 A).—T. H. P.

Aluminium; Metallography of — R. J. Anderson. J. Franklin Inst., 1919, 187, 1—47.

RECENT research by the crystal analysis method of Bragg, modified by Hall (Phys. Rev., 1917, 9, 564—5) has shown that the crystal structure of aluminium is tetragonal and not isometric. Cast aluminium readily forms dendritic crystals on cooling, but the commercial metal is rarely of a high state of purity as compared with the purity of commercial copper, zinc, and tin. Metal containing 0.15% Cu, 0.30% Fe, 0.30% Si, and 99.15% Al (by difference) represents a fairly good commercial product, and the influence of iron and silicon, although not thoroughly understood, is important, both in commercial aluminium and in aluminium alloys. If cooled slowly, aluminium will retain up to about 4.5% Cu in solid solution (see also this J., 1918, 246 A). Iron forms a compound, FeAl, only slightly soluble in the solid state, and silicon can exist in solid solution or as crystals of free silicon (see also this J., 1919, 43 A). During the annealing of cold-rolled sheets an increase in hardness has been noted after very short exposures (this J., 1918, 424 A, 537 A). Cold working of aluminium tends to produce an amorphous condition of the metal, and aluminium, subjected to excessive cold working, shows an entire absence of structure and has the appearance of having passed into the vitreous state. The reverse process (of recrystallisation) takes place very slowly during annealing, and re-orientation and grain growth are not cogent factors in the softening of cold-worked metal. The effect of silicon and iron may be to retard grain growth. Aluminium which has been differentially strained, as by cold shearing, exhibits exaggerated grain growth on annealing, the grains of largest size being found a short distance away from the sheared edge of the metal. The pure metal, or its ductile alloys, show the formation of slip bands when strained, but no twinning has been observed as a result of direct mechanical strain. The polishing and etching of aluminium for micrography is difficult (this J., 1918, 211 A), but hydrofluoric acid, followed by immersion in concentrated nitric acid has hitherto proved most useful, although a tendency to develop etching pits is shown.—C. A. K.

Zinc dust; An abnormal form of — O. Mühlhauser. Metall und Erz, 1919, 16, 70.

THE author describes an abnormal form of zinc dust containing cadmium which is formed by the grey fumes emitted from the mouth of the condenser of a zinc furnace soon after the water vapour has escaped from the charge of roasted blende and anthracite. It occurs sometimes in the receiving vessel and if blown out into the air settles only with difficulty. It is dark grey or grey blue in colour, friable, and feels like tinder. It is an agglomerate of zinc oxide, cadmium oxide, metallic zinc and cadmium, and carbon dust, as confirmed by the following analysis: Zn 43.72%, Cd 11.74%, Fe 1.52%, C 28.84%. It is produced as follows: The metal vapour first formed by the reduction of the cadmium oxide and zinc oxide is partly oxidised by the carbon dioxide in the muffle gases and partly cools to a fine metallic mist. The droplets, consisting for the most part of a zinc-cadmium alloy having a low eutectic point, coalesce and attach themselves to dust particles and so form a deposit which quickly grows to a light porous aggregate. These structures resemble in many respects those observed during the formation of silicon carbide (cf. Mühlhauser, Z. anorg. Chem., 1893, 5, 119).—T. H. Bu.

Electroplating on iron from copper sulphate solution. O. P. Watts. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 10 pages.

AN adherent deposit of copper can be obtained on iron or steel using copper sulphate as electrolyte, if the object is first immersed in a solution of an arsenic, lead, or bismuth salt. The preliminary coat of nickel or the use of a cyanide electrolyte before the sulphate is thus avoided. This result is presumably due to the production on the iron of a film of metal whose potential is sufficiently near to that of copper to permit the deposition of a good copper plate, and not so far below that of iron that the film produced is of a powdery non-adherent character. In the same way bismuth can be deposited on iron by using a preliminary arsenic or antimony dip, and nickel can be deposited on aluminium after dipping it in ferric chloride solution.—W. H. P.

Pitting of electroplating; Remarkable —. O. P. Watts. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 3 pages.

HEAVY pitting which appeared during the plating of steel articles with lead was found to be due to air dissolved in the electrolyte. The bath of lead silicofluoride was worked by day at about 45° C. and cooled down in the night to about 25° C. The air dissolved during the cooling was deposited on the electrodes when the bath was again heated by passage of the current. The deposition took the form of minute bubbles which adhered to the electrodes and thus started the pitting.—W. H. P.

Uranium: its extraction from pitchblende. G. Gin. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 6 pages.

A METHOD is proposed involving the following stages: (1) Roasting to remove sulphur and arsenic. (2) Heating in an electric furnace with a limited amount of carbon to give metallic lead, copper, iron, nickel, cobalt, and some tungsten, together with a slag containing silica and lower oxides of uranium, vanadium, tungsten, and molybdenum. (3) Treatment of the slag from (2) with enough carbon to convert the oxides into carbides. On treatment with water at 60° C. uranium carbide is decomposed, giving the hydroxide, which can be separated by flotation and used for the preparation of uranium or its salts.—W. H. P.

Magnetic concentration of pyrrhotite ores. J. P. Bonardi. Chem. and Met. Eng., 1919, 20, 266—270.

THE utilisation of pyrrhotite ores for the production of sulphur in the manufacture of sulphuric acid is increasing, though the available sulphur is diminished by the presence of up to 30% of gangue material, consisting chiefly of granular silica, magnesia, lime, and silicates of the amphibole group. Magnetic separation of the ore before roasting is suggested and trials on a particular sample proved successful. Concentration was carried out on an experimental type of Wetherill magnetic separator and a current of 3 amperes was found to give the best commercial separation. Classification of the ore was unnecessary, provided that it was crushed to pass a sieve with 10 meshes per linear inch, in order to detach the sulphide from the gangue. Fine material passing a sieve with 100 meshes per linear inch cannot be separated, as the non-magnetic material is removed mechanically by the magnetic portion. A concentrate containing less than 7% of gangue was obtained from the mine discard ore, giving a recovery of between 85 and 90% of the sulphur and iron values.—C. A. K.

Pyromorphite group. M. Amadori. Gazz. Chim. Ital., 1919, 49, I., 38—102.

A SUMMARY of previous work on the synthesis of minerals of the pyromorphite group, crystallographic investigations on some of these synthetic products and the compositions of natural pyromorphites.—T. H. P.

Effect of graphite ash in crucibles. Booze. See VIII.

PATENTS.

Iron; Preparation of pure —. R. H. Muench, Goldfield, Colo. U.S. Pat. 1,292,630, 28.1.19. Appl., 13.8.18.

IRON is precipitated from an impure ferrous solution, as potassium ferrous-ferrocyanide, which is decomposed by concentrated hydrochloric acid, excess of acid being removed by evaporation. The resulting ferrous chloride is dissolved in water, separated from any insoluble residue, and used for the production of pure iron.—T. H. B.

Steel; Device to lessen oxidation while tapping — from smelting furnaces. D. Robertson, Motherwell, Scotland. Eng. Pat. 123,793, 7.2.18. (Appl. 2213/18.)

EXPOSURE of molten steel to air during the usual practice of pouring into a ladle is avoided by the use of a shoot, with removable cover, from which the moulds are filled direct. The shoot is made in two parts, the section nearer the furnace being removable to permit access to the tapping hole. When the tapping hole has been opened, metal flows into the shoot to the far end, which is at a slightly lower level, and into a mould through one or more nozzles, controlled by stoppers.—C. A. K.

Furnaces for melting steel and other metals. I. Hall, Birmingham, and W. Bailey, Manchester. Eng. Pat. 123,778, 25.8.17. (Appl. 12,200/17.)

IN order to prolong the life of the lining of furnaces of the Siemens type, the preheated air is led into the end of the furnace through a flue which is expanded into funnel shape as it enters the furnace. At either side, or preferably immediately below the air port, converging ports admit preheated gas so that combustion is concentrated along the centre of the furnace and away from the side walls.

—C. A. K.

Blast-furnace practice. H. B. Weaver, Catasauqua, Pa., and J. Gayley, New York. U.S. Pat. 1,292,937, 28.1.19. Appl., 8.8.18.

AN atmosphere of reducing gases is produced in the furnace by a heated air blast introduced under pressure, and such portions of the reducing gases as are not required for maintaining the desired reducing conditions in the stack are withdrawn and treated for the separation of the compounds of alkali metals therein. The gases are withdrawn at a point in their upward travel below that at which the alkali metal compounds would be precipitated by the colder materials in the furnace. The withdrawals of gases take place periodically so as to allow of the accumulation of the compounds in the periods of time between withdrawals. The furnace conditions are regulated so as to produce slag of a light colour.—J. H. P.

[Roasting] furnace; Mechanical feeding —. G. Gröndal, Djursholm, Sweden. Eng. Pat. 115,640, 8.5.18. (Appl. 7734/18.) Int. Conv., 26.4.17.

IN a mechanical roasting furnace of the type having an arch with a reciprocating movement as described

in Eng. Pat. 115,639 (this J., 1919, 78A), the rabblies, fixed to the arch of the furnace, are triangular in cross-section, and have their apices turned away from the discharge end of the furnace. The transverse faces of the rabblies move the material a certain distance forward as the furnace arch moves, whilst on the return movement the oblique sides of the rabblies push the material laterally into the path of the adjacent rabblies, which during the next forward movement again push the material towards the outlet end of the furnace.—C. A. K.

Reduction furnace. T. F. Baily and F. T. Cope, Alliance, Ohio, Assignors to The Electric Furnace Co. U.S. Pat. 1,291,716, 21.1.19. Appl., 25.1.18.

CARS containing the material to be heated are caused to travel on a track through a heating chamber. A hood, designed to fit around the cars, extends from the furnace, so that heat leaving the furnace chamber may preheat the charge entering.

—C. A. K.

Container for articles to be heat-treated and the like. T. F. Baily and F. T. Cope, Alliance, Ohio, Assignors to The Electric Furnace Co. U.S. Pat. 1,291,717, 21.1.19. Appl., 14.6.18.

METAL articles to be subjected to heat-treatment are placed in containers and the containers are passed as a continuous train through a furnace, each container pushing the preceding one and forming a closure for it.—C. A. K.

Furnace; Annealing —. V. E. Lane, Detroit, Mich. U.S. Pat. 1,292,617, 28.1.19. Appl., 18.4.18.

A MUFFLE furnace is supported in a water-seal above a pit, within which is a work-supporting table which can be raised so as to form the bottom of the muffle. Tunnels extend laterally in an upward direction from the pit, at the level of the table when in its lowered position, so that articles may be introduced through the water-seal on to the table.

—C. A. K.

Removing accretions from mechanical tuyères; Process and apparatus for —. C. Van Amburgh, Tacoma, Wash., Assignor to American Smelting and Refining Co. U.S. Pat. 1,292,162, 21.1.19. Appl., 21.5.18.

The volume and pressure of the air current through the tuyère are increased intermittently by connecting a high-pressure air line to the ordinary low-pressure air main. At intervals the low-pressure air main is closed, and the high-pressure air valve is opened.—C. A. K.

(A) *Galvanoplastic method and apparatus.* (B) (C) (D) *Electrolytic process.* (E) (H) (J) *Electrolytic process and product.* (F) (G) (I) *Galvanoplastic process and product.* M. M. Merritt, Danvers, Assignor to Copper Products Co., Boston, Mass. U.S. Pats. 1,282,261—70, 22.10.18. Appl., (A) 29.3.17, (B) (C) (D) 27.6.17, (E) (F) (G) 2.11.17, (H) (I) (J) 8.12.17.

(A) For the electrolytic production of copper tubes a metallic (preferably brass) mandrel is used, the surface of which has been coated with mercury. (B) For the production of metallic sheets electrolytically the metal is deposited on a cylindrical cathode which is partially immersed in the electrolyte and rotated at a peripheral speed of about 130 ft. per min. The cathode is preferably coated with a thin film of grease. (C) To prevent irregular deposits on or adjacent the edges of metallic plates deposited electrolytically on a mandrel which serves as cathode, a conductor is provided adjacent the edges of the cathode to form a supplementary

cathode. (D) In the production of metallic sheets by electrodeposition, a thin sheet of the metal is deposited on a mandrel, a flexible non-conducting material is wound as a helix on the deposit, and electrodeposition is then continued, whilst the mandrel is being rotated, until a sheet of the desired thickness is obtained. The sheet is removed from the mandrel by tearing along the line of the helix.

(E) (H) (J) Articles such as aeroplane propellers are produced by coating a core with a layer of electrolytically conductive material, depositing on this a film of metal by electrodeposition, applying a film of grease or metal amalgam to the deposit, and then building up the deposit to the desired thickness by deposition of successive layers of metal separated by films of grease or of amalgam. (F) (G) (I) Articles such as manifolds for aeroplane engines are produced by electrodeposition by methods similar to those described under (E) (H) (J).

Plating with metal; Apparatus for and method of —. J. E. Woodbury, Worcester, Mass. U.S. Pat. 1,291,337, 14.1.19. Appl., 29.5.15.

AN electroplating apparatus comprises an anode member having a bottom through which the electrolyte can pass, and a cathode located under the anode bottom, with means for circulating the electrolyte through parts of the anode on to the cathode and back through other parts of the anode.—B. N.

Electroplating apparatus. J. Giuliana, Newark, N.J. U.S. Pat. 1,291,830, 21.1.19. Appl., 1.11.17.

A ROTATING barrel is supported on a post in an electrolytic tank, the rotation of the barrel tending to swing the opposite ends of the post against supporting means on opposite sides, thus holding the post in an upright position. The current is supplied through the axle to a brush rotating with the barrel, and the cathodes are in electrical connection with the brush. The barrel is provided with an intermediate removable annular shell, on the circumference of which cathode members are mounted, and the articles, tumbling within the barrel, make contact with the cathodes. Connections, suitably covered, are arranged between the cathodes along the circumference of the shell for connecting them together, whilst the cathode members are exposed to the electrolyte which passes through the permeable ends of the barrel.—B. N.

Metals; Process of recovering — from ores. R. Gabl, Miami, Ariz. U.S. Pat. 1,291,824, 21.1.19. Appl., 8.11.17.

ONE pulp from which the slime has been removed is subjected to flotation to produce a "middling" product, which is roasted and leached to obtain a solution of the metal. The tailings from the flotation process are also leached.—C. A. K.

Sherardising articles; Apparatus for —. H. C. Harrison, Lockport, N.Y. U.S. Pat. 1,291,866, 21.1.19. Appl., 31.8.16.

ARTICLES of great length and small cross-section are caused to travel through an elongated chamber containing zinc dust at a suitable temperature. At each end of this chamber, and in alignment with it, is another chamber packed with cold zinc dust, which forms an air seal for the central section.

—C. A. K.

Manganese and other ores; Process of extracting values from —. E. W. Haslup, Bronxville, N.Y., and B. A. Peacock, Philadelphia, Pa. U.S. Pat. 1,291,867, 21.1.19. Appl., 7.11.17.

THE finely divided ore is mixed with sulphuric acid and the mixture kept in a closed container until

the heat of reaction has raised the temperature of the mass to more than 100° C. The metal sulphates in solution are then recovered. (See also this J., 1918, 772 A).—C. A. K.

Carburising material and method of producing the same. G. W. Pressell, Assignor to E. F. Houghton & Co., Philadelphia, Pa. U.S. Pat. 1,292,044, 21.1.19. Appl., 23.5.17.

Coconut shells are carbonised in a retort, and, at or near the heat of distillation, subjected to the action of an aqueous solution of sodium carbonate.—T. H. B.

Ores; Process of sintering —. A. H. Richards, Salt Lake City, Utah, Assignor to American Smelting and Refining Co. U.S. Pat. 1,292,059, 21.1.19. Appl., 27.10.15. Renewed 10.5.18.

THE top surface of a layer of ore is ignited and subjected at the same time to a downward current of air passing through it, the resistance to the passage of air decreasing as the charge becomes sintered. A second layer of ore is then deposited on the first, and is in turn ignited under similar conditions.—T. H. B.

Blast furnace dust, fine ores, cements, etc.; Process and apparatus for sintering — in rotary tube furnaces. Stahlwerk Thyssen A.-G., Hagen-dingen. Ger. Pat. 309,552, 21.5.16.

BEFORE the material arrives in the sintering zone it is subjected to a preliminary treatment in a portion of the furnace the inclination of which is adjustable in relation to the inclination of the rest of the furnace, so that the forward velocity of the material may be controlled. The tubular rotary furnace is constructed in two or more parts which are independently adjustable as regards their inclination, the part in which the preliminary treatment takes place having a larger diameter than the other parts of the furnace.—J. F. B.

Copper; Hydro-metallurgy of —. W. N. Rossberg and G. E. Sheridan, Butte, Mont. U.S. Pat. 1,292,075, 21.1.19. Appl., 20.12.17.

OXIDISED copper ores are leached with sulphuric acid and copper is precipitated from the solution as cuprous sulphide by treatment with hydrogen sulphide in the presence of excess of sulphur dioxide. Further amounts of ore are leached with part of the regenerated acid, and sulphides are decomposed by other portions of it to produce hydrogen sulphide for further precipitation of cuprous sulphide.—T. H. B.

Zinc ore; Method of treating —. D. B. Jones, Chicago, Ill. U.S. Pat. 1,292,330, 21.1.19. Appl., 10.6.18.

ZINC ore is made into balls with suitable reducing material, and passed through a heating chamber so inclined that the balls travel along it by gravity. A sufficient amount of air is admitted to the chamber to convert any zinc vapour into oxide. The balls are then passed through a suitable spelter furnace, subjected to a sufficient heat to expel the greater portion of the zinc content, which is condensed in the metallic form, and finally the balls are passed through an oxide furnace in which they are subjected to a higher degree of heat to expel the remaining zinc content, air being supplied to convert the metallic vapour to oxide.—T. H. B.

Copper and brass tubes; Method of and apparatus for bright-annealing —. J. A. Moorhead, Sewaren, N.J. U.S. Pat. 1,292,352, 21.1.19. Appl., 28.3.18.

LONG copper or brass tubes are passed progressively and continuously through a long alternating-current

coil and are thereby heated to the proper annealing temperature by induced electrical currents. The coil is enclosed in a tube of non-conducting non-magnetic refractory material within which a non-oxidising atmosphere is maintained. An extension of the tube dips into a cooling medium so that the annealed tubes pass from the heated zone into the cooling medium without being exposed to oxidation.—T. H. B.

Metals; Reclaiming turnings of readily oxidisable —. J. Coulson, Wilkinsburg, Pa., Assignor to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,292,582, 28.1.19. Appl., 22.9.15.

THE sub-divided metal is boiled in a solution of a fluxing agent, and added in small quantities at a time to a molten mass of the same metal while still moistened with the solution. The slag which separates is heated with an alkaline-earth chloride, and the molten metal which separates is removed. A small amount of de-oxidising agent containing calcium aluminium silicide is added to the molten metal.—T. H. B.

Zinc-lead alloy. H. Falkenberg, Weetzen. Ger. Pat. 309,695, 28.5.16. Addition to Ger. Pat. 300,111.

ACCORDING to the principal patent an alloy containing 1.6% of iron, 94.9% of zinc, and 35% of lead was prepared at a melting temperature of 450° C. for use as a bearing metal; it had a crushing strength of 1470 kilos. per sq. cm. By raising the melting temperature and increasing the iron to 3%, a still higher resistance may be attained, for instance, an alloy melted at 1000° C. possesses a crushing strength of 1620 kilos. per sq. cm.—J. F. B.

Lead sodium alloy. W. Stockmeyer, Minden, and H. Hanemann, Charlottenburg. Ger. Pat. 309,758, 11.4.16.

A LEAD-SODIUM alloy is prepared containing less than 1.5% of sodium and less than 1% of magnesium. The small addition of magnesium considerably increases the hardness of the alloy.—J. F. B.

XI.—ELECTRO-CHEMISTRY.

Inductive heating with high-frequency currents. E. F. Northrup. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 89 pages.

THE author shows that it is a feasible and efficient method of inductive heating to employ very high frequency current, and thus dispense with the inter-linkage of an iron magnetic circuit with the primary and secondary electric circuits. He gives an exhaustive mathematical treatment of the principles involved, leading to a description of the laboratory installations used. In these it is possible to secure rapid heating of a crucible and its contents with thermal efficiency up to 60%, and to attain temperatures of 1800°–2000° C. Several kilos. of "Pyrex" glass, metallic iron and nickel have been rapidly melted both in air and in *vacuo*. The requisite frequency is secured by an oscillatory current circuit containing condensers and a discharge gap. Each rupture of the gap causes the condensers to discharge in an oscillatory manner, the oscillations damping out logarithmically. A specially devised gap, shown diagrammatically at *g* in fig. 1, consists of graphite electrodes projecting into an iron box containing mercury and an atmosphere of alcohol vapour. When the discharge is taking place a very localised high temperature and consequent low resistance are maintained in the gap, and the oscillatory discharge proceeds in the

gap itself with little loss of energy. When the oscillations have nearly died out, and when the voltage between the mercury and one solid electrode reaches a certain minimum, the "negative electrode resistance" of mercury acts suddenly to open the circuit completely. This shuts off all flow of current from the supply transformer and thus completely avoids arc formation without the necessity for any air blast or rotating electrodes. The gap is practically noiseless and no chemical action takes place. For the high potential power condensers sheet glass has been found the most convenient dielectric under laboratory conditions. Owing to heating effects, however, such condensers cannot be used for more than three to four hours with oscillatory currents. It is therefore necessary, in long operations, to provide a duplicate set of condensers, so that one may be cooling while the other is in use. The glass and sheet metal plates are stacked and kept under oil to prevent brush discharge. A commercial condenser of similar type has paper for dielectric and aluminium foil

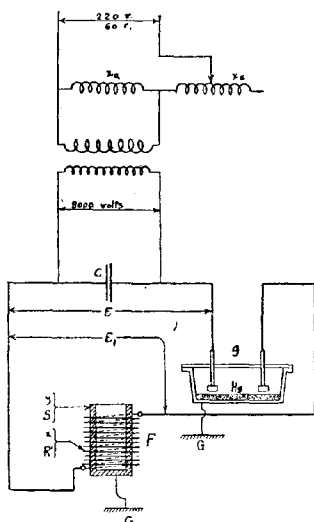


FIG. 1.

0.025 mm. thick for metal sheet. The layers are built up and strongly compressed under oil, and the built-up structure is sealed under oil in a metal case *in vacuo*. Such condensers cost twice as much as glass ones of similar capacity, but they are more portable and do not undergo dangerous heating. They cannot, however, be easily repaired when ruptured. The circuit used with single phase discharge is shown diagrammatically in Fig. 1. The furnace represented by F has usually a primary inductor coil with 50 or more turns. Within this is fitted a cylinder of micanite or quartz to give electrical insulation from the crucible or object to be heated. A convenient method of heating a small mass of material to a high temperature is to have within the insulation a "focus inductor," which is a single-turn coil made up of as many straps of conducting metal as will give a length approximately equal to that of the primary coil. These straps are arranged as shown in Fig. 2 connected to an interior portion which encloses the mass to be heated and which must be capable of resisting the temperature to be attained. This arrangement has the effect of focussing the electromagnetic field upon the mass to be heated. The high-frequency method of inductive heating can be very con-

veniently applied in the rapid melting of ferrous alloys in surroundings absolutely free from carbon. A cylinder of the metal or fragments occupying the same space is embedded in fine sand, lime, magnesite, or similar material, enclosed in a quartz tube and surrounded by a copper tube with ten or more turns wound round the cylinder. Water is circulated through the tube, the ends of which are



FIG. 2.

connected to the secondary of a suitable air transformer. A high-frequency E.M.F. (10^5 cycles or more) is applied to the primary. The embedded mass rapidly fuses, retaining its shape in the mould from which it may, if desired, be run off through a plug-hole. In such experiments it is found that vigorous circulation takes place in a mass of molten conducting material lying in a non-conducting container. Under the influence of induced current the molten material flows upward along the axis of a cylindrical chamber and downward along its circumferential region.—W. H. P.

Electric furnace; Temperature uniformity in an
— J. B. Ferguson. Chem. and Met. Eng.,
1919, 20, 283-288.

THE maintenance of a region of uniform temperature in an electric furnace requires that compensation be made for the heat losses at all points, and as the heat losses are never uniformly distributed, the heat supply must likewise be non-uniformly distributed. In a tube furnace it is necessary to control the heating of the ends independently and in the design of a furnace 45 cm. long, capable of heating uniformly a region 10-12 cm. long and 6 cm. diam., the centre was uniformly wound and the end sections, each independently controlled, were wound more closely. The heating element was composed of two helically grooved alundum tubes, one of which would easily slide into the other. Each end of the smaller tube was wound for a distance of 10 cm. with 0.8 mm. diam. platinum wire, and the whole was coated with alundum cement and baked. The tube was then inserted into the larger tube and the ends of the coils brought through holes made for the purpose, and wound back on the outer tube to its ends. The centre portion of the outer tube was then separately wound, and the whole covered with alundum paste. The heating tube was insulated with successive layers of magnesite, fireclay, and "calorox," and plugs were fitted in the ends of the tube. In general, the use of alternate layers of good and poor conductors effects the best insulation. The furnace as constructed gave a temperature

uniformity of $\pm 0.5^\circ$ at temperatures ranging from 620° to 1190° C. and a constancy of $\pm 0.25^\circ$ C. at 1000° C. and 1190° C.—C. A. K.

PATENTS.

Furnaces; Control of electric —. W. J. Howard, Sheffield. Eng. Pat. 123,845, 13.3.18. (Appl. 4428/18.)

AN apparatus for raising and lowering an electrode in an electric furnace is combined with a solenoid or electromagnet, which is arranged in a shunt circuit between the electrode and the bath. The solenoid is inoperative during the normal working range of the voltage, but, when the latter drops below a predetermined value, acts upon the raising and lowering mechanism. The armature or movable member of the electromagnet or solenoid is acted upon by a spring or equivalent, which exerts little force upon the armature during the first stages of its movement, but acts strongly during the later stages.—B. N.

Furnaces; Regulator for electric —. F. W. Smith, Westfield, N.J. U.S. Pat. 1,282,478, 22.10.18. Appl., 5.1.18.

THE regulator comprises a fluid motor, e.g., a compressed air engine connected to one or more of the furnace electrodes and adapted to change their position. An electro-magnetic device, normally cut out of the circuit, is provided for regulating a valve for controlling the motor, the electro-magnetic arrangement being responsive to variations in the electric conditions of the electrode circuit, and adapted automatically to move the valve to shut off the motor on failure of voltage in the electrode circuit.—B. N.

Furnace; Electric —. C. A. Cadwell, Assignor to The Electric Railway Improvement Co., Cleveland, Ohio. U.S. Pat. 1,290,902, 14.1.19. Appl., 1.5.15.

THE bottom of the furnace chamber is formed of granular high-resistance conducting material, and adjustable electrodes are mounted in the chamber above the material. Arcs are formed between the electrodes and the resistor material, and the furnace is surrounded by an electro-magnetic coil, so as to produce a magnetic field for directing and steadying the arcs. Two furnaces may be connected in series, one being adapted to act as a rheostat and preheating furnace during the heating operation of the second, and the latter is then adjusted to act as the rheostat and preheater during the final heating operation of the first.—B. N.

Electrodes. E. Newbery, Manchester, and H. Gerard, Harwich. Eng. Pat. 123,936, 14.10.18. (Appl. 16,762/18.)

AN electrode, for use in the detection of objects submerged in chloride solutions such as sea water, is formed of or coated with silver which is in electrical connection with a conductor, and no metallic surface, except silver, is exposed to the chloride solution. Silver chloride is applied to or deposited electrolytically on the silver surface, and the electrode is preferably enclosed in a protective wrapping of porous material, such as canvas or flannelette.—B. N.

Electrolytic cell. E. E. Niswonger, Dayton, Ohio, and P. McDorman, Niagara Falls, N.Y., Assignors to The Electro Chemical Co., Dayton, Ohio. U.S. Pat. 1,292,024, 21.1.19. Appl., 28.9.18.

A SERIES of vertical electrodes, of height less than that of the cell, are mounted in the bottom of the cell, and glass insulating members, extending to the top of the cell, are arranged to rest upon the electrodes.—B. N.

Battery; Electric —. N. K. Chaney, Lakewood, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,292,254, 21.1.19. Appl., 17.6.18.

A DRY cell mixture contains carbon free from ferrous sulphide.—B. N.

Electric storage batteries; Process for preventing formation of an explosive gas mixture in —. A. Aicher, Mülheim. Ger. Pat. 308,996, 1.12.17.

THE danger due to the formation of an explosive mixture of gases during the charging of accumulators is minimised by leading a current of air into the electrolyte and thus diluting the gases.—J. F. B.

Galvanic cell with two electrolytes separated by a diaphragm. Schuster-Patent-Ges. m.b.H., Berlin. Ger. Pat. 309,531, 28.12.16.

THE two electrolytes have different densities, the lighter liquid which surrounds the diaphragm standing at a higher level than the heavier liquid which is inside the diaphragm. Thus a portion of the diaphragm is only moistened with liquid on the outer side and the lighter liquid is enabled to penetrate more easily to the inside. Moreover, the lighter liquid also has access on the outside to the bottom of the diaphragm, and its penetration upwards through the diaphragm into the heavier liquid is assisted by the difference in the specific gravity of the two liquids. The intimate interpenetration of the two liquids may be assisted by constructing the upper part of the diaphragm with thinner walls than the lower, so that the access of the lighter electrolyte to the heavier is facilitated.—J. F. B.

Permanganates. U.S. Pats. 1,291,680—2. See VII.

Recovering bromine. U.S. Pat. 1,292,016. See VII.

XII.—FATS; OILS; WAXES.

Orange seed oils. I. S. Kobayashi. Kōgyō-Kwagaku Zasshi (J. Chem. Ind. Tokyo), 1918, 21, 1235—1245.

AN account of analyses of the oils from the seeds of the citron (*Citrus aurantium*, L., sub-sp. *juenos*, Mak.), Chinese citron (*C. aurantium*, L., sub-sp. *sinensis*, Engl.), and kumquat (*Fortunella japonica*, Swingle). The characters of the oils are shown in the following table:—

—	Oil from seed of:		
	Citron	Chinese citron	Kumquat
Sp. gr. at $15\frac{1}{4}^\circ$ C. ..	0.9221	0.9200	0.9223
Acid value ..	4.97	0.90	1.05
Saponification value ..	195.1	192.7	193.4
Iodine value (Wijs) ..	100.12	105.27	113.03
Refr. index at 20° C. ..	1.4720	1.4722	1.4730
Unsat. matter, % ..	1.28	1.22	1.22
Fatty acids:			
Sp. gr. at $50\frac{3}{4}^\circ$ C. ...	0.8714	0.8738	0.8725
M.pt., $^\circ$ C. ..	33.5—34	40—41	32—33
Solidif. pt., $^\circ$ C. ..	29—30	33.5—34.5	26—27.5
Neutralisation value ..	200.9	202.9	199.2
Mean mol. wt. ..	279.6	276.8	281.7
Refr. index at 40° C. ..	1.4551	1.4558	1.4576
Iodine value (Wijs) ..	102.43	105.9	114.05

THE oils are of the semi-drying class, and the proportion of solid fatty acids is about 19—27%.

—J. C. W.

Glycerol; Determination of — and the water content of glycerin from the specific gravity and boiling point. A. Grün and T. Wirth. *Z. angew. Chem.*, 1919, **32**, 59—62.

RECORDED values for the sp. gr. of pure glycerol at 15°/15° C. range from 1.2594 (Nicol) to 1.2690 (Lenz). In the case of highly concentrated glycerin the sp. gr. alters, according to various authorities, by 0.0025 to 0.0030 for 1% of water. Glycerol purified by distilling twice in a vacuum and dried over phosphorus pentoxide in a vacuum for 5 months had the sp. gr. at 15°/15° C. 1.2653±0.0001, which agrees with the value given by Gerlach, and it is concluded that the table given by Gerlach (this J., 1885, 226) is the most trustworthy for determining the amount of glycerol from the sp. gr. For determining small quantities of water in glycerin the boiling-point method affords the most accurate means, the presence of 1% of water lowering the b.pt. of pure glycerol from 290° C. to 239° C. Schleiermacher's method (Ber., 1891, **24**, 944, 2251), in which the glycerin is heated over mercury in a sealed capillary extension of a U-tube, may be conveniently used for this determination. The following results were thus obtained:—

Glycerol %	100	99.5	99	98.5	98	97.5	97	96.5	96	95.5	95
B. pt. at 760 mm. .	283-284	243-244	224-225	267-268	195-196	185-186	178-179	171-172	167-168	163-164	160-161
° C.											

The lower b.pt. of the 100% glycerol as compared with that found by Gerlach (*loc. cit.*) is attributable to the absorption of 0.05% water in charging the capillary tube. Heated in a distillation flask the same glycerol showed a constant b.pt. of 289°—290° C. The presence of organic or inorganic salts (e.g. 1% of sodium chloride) in technical glycerins did not affect the b.pt., but the method is not applicable to glycerins containing more than traces of polyglycerols. For technical purposes the b.pt. may be determined by Emich's method (Monatsh. Chem., 1917, **38**, 219) in an ordinary capillary tube. (See also *J. Chem. Soc.*, May, 1919.)—C. A. M.

Distillation of albumin. Pictet and Cramer. See XIXA.

PATENTS.

Chemical reactions [hydrogenation]; Method of effecting —. R. F. Steward, Washington, D.C. U.S. Pat. 1,284,488, 12.11.18. Appl., 19.8.12. Renewed 10.6.16.

A FLUID mixture of an unsaturated fatty acid or other substance with a catalyst is thrown by centrifugal force into a layer or film (e.g. by being fed on to a rapidly rotating surface near the axis thereof), and is simultaneously exposed to the action of hydrogen or other reacting gas.—C. A. M.

Fatty substances; Hydrogenation of —. J. Boyce, Chicago, Ill., Assignor to American Cotton Oil Co., Guttenberg, N.J. U.S. Pat. 1,291,384, 14.1.19. Appl., 7.3.12.

HYDROGEN is passed into a charge of oil which contains a divided catalyst and may be *in vacuo*, and after the absorption the excess of hydrogen is passed on to a second charge of oil also *in vacuo*. In one modification of the process the oil, after hydrogenation, is removed from the vessel leaving the catalyst behind, and a second charge of oil is introduced, care being taken to exclude air from the vessel.
—C. A. M.

Oil; Process of hardening —. C. Ellis, Montclair, N.J. U.S. Pat. 1,294,068, 11.2.19. Appl., 2.2.16. A CURRENT of hydrogen is made to circulate through a comparatively shallow layer of oil, containing a finely-divided catalyst, the unabsorbed gas collected,

and a portion thereof purified, dried, and returned to the main body of the gas, which is then heated, and again passed through the oil. In a modification of the method a relatively large proportion of the hydrogen is purified and dried at that stage of the process at which a large amount of water is formed, and only a small proportion at the stage when only a little water is produced.—C. A. M.

Grease and oils; Apparatus for extracting — from garbage. C. Edgerton, Philadelphia, Pa. U.S. Pat. 1,293,738, 11.2.19. Appl., 2.12.16.

GREASE etc. is extracted from garbage in a tank-like receptacle with a vertical cylindrical wall, which is heated by means of internal steam coils connected with a series of pipes outside the vertical wall.—C. A. M.

Cotton-seed; Preparation of — for milling. W. E. McCaw, Assignor to The Procter and Gamble Co., Cincinnati, Ohio. U.S. Pat. 1,295,830, 11.2.19. Appl., 21.7.13.

Prior to milling, cotton-seed is heated for a short time at 160° to 180° F. (71°—82° C.) and then cooled to atmospheric temperature.—C. A. M.

Fat, wax, resin, etc. from vegetable cellulosic materials; Process for recovering —. C. G. Schwalbe, Eberswalde. Ger. Pat. 309,555, 3.8.17.

THE raw plant materials are treated with acids, acid salts, or salts which produce acids; they are then heated or dried by heat and extracted with suitable solvents after neutralising the acid, if necessary. The yield of fatty substances is doubled by the preliminary treatment with acid. For instance, 1.5% of waxy matter can be extracted from straw by chloroform but after the treatment with acid 3% is obtained. Wood, leaves, peat, chaff, etc. may also be treated in the same manner.—J. F. B.

Soaps containing benzene hydrocarbons in soluble form; Preparation of —. J. Simon und Dürkheim, Offenbach. Ger. Pat. 309,574, 10.10.16. Addition to Ger. Pat. 267,439.

ALKALI salts of naphthenic and polynaphthenic acids are used in place of vegetable and animal fatty acids in soaps, as they possess a greater absorptive capacity for hydrocarbons.—J. H. J.

Solvents for fats. Eng. Pat. 124,072. See IIA.

Lubricating-grease. U.S. Pat. 1,294,136. See IIA.

Grease from wool-washing water etc. Eng. Pat. 123,048. See V.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Coumarone resins; Technical —. J. Marcusson. *Chem.-Zeit.*, 1919, **43**, 93—94.

THE amount of coumarone resins produced annually in Germany rose from about 6000 tons prior to the war to 10,000 to 11,000 tons in 1917. The resins have been classified in 30 different grades, according to their hardness and colour, whilst four grades of distillation residues containing coumarone resin have been distinguished. The maximum price per 100 kilos. ranged from M.50 for black fluid resins to M.250 for pale hard and brittle resins. Coumarone

resins are soluble in the ordinary solvents for fats, with the exception of petroleum spirit, but this drawback may be remedied by adding benzene or solvent naphtha to the petroleum spirit. They are mainly utilised in the paint and varnish industry, a mixture of coumarone resin and boiled linseed oil drying to a durable, hard, non-sticky film. In the drying of a coumarone resin varnish the following processes occur:—(1) Evaporation of the solvent; (2) partial evaporation of the oily constituents of high b.pt.; (3) oxidation of the paraindene; (4) conversion of the paracoumarone into a polymeric modification. The varnish without the addition of linseed oil, tung oil, etc., has the drawback of yielding films which are lacking in elasticity and resistance to weather, whilst, even when completely dry, the layer is softened by the addition of a second coat. Considerable quantities of coumarone resins are also used in the manufacture of printing inks. The best preparations contain a mixture of ordinary lithographic varnish with the soft or fluid resins, whilst for newspaper inks mixtures of coumarone resins with mineral oil or tar oil, or distillation residues containing coumarone resins are used. A further application of these products is for sizing paper. Although they cannot be saponified, even when heated with alcoholic alkali in an autoclave, or by heating with soda-lime at 230° to 280° C., they can be made into an emulsion with glue or with rosin soap, which is suitable for this purpose.

—C. A. M.

PATENTS.

Titanium products [for pigments etc.]. Titan Co. A/S., Christiania, Norway. Eng. Pat. 116,266, 10.4.18. (Appl. 6111/18.) Int. Conv., 24.5.17.

THE SO_2 present in titanium hydroxide precipitated from a solution of the sulphate is neutralised by treatment with an insoluble alkaline-earth compound. For example, moist precipitated hydroxide (100 kilos.) containing TiO_2 , 44.0; SO_2 , 3.4; H_2O (combined), 9.7; water, 42.9%, is mixed with finely powdered chalk (5.72 kilos.) and the mass is calcined in a rotary furnace, whereby the excess of chalk is converted into calcium titanate whilst the hydroxide is converted into titanium dioxide. The resulting product contains TiO_2 , 84.0; CaTiO_3 , 3.8; and CaSO_4 , 12.2%. Calcination is facilitated by the porous condition of the mass, brought about by the carbon dioxide which escapes on neutralisation. Calcium titanate has a high refractive index ($n_D = 2.4$), and a low solubility. The alkaline-earth compound may also be used in quantity only just sufficient to neutralise the SO_2 present.—E. W. L.

Dopes; Production of —. Cellon, Ltd., T. Tyrer and Co., Ltd., and T. Tucker, London. Eng. Pat. 123,628, 26.3.18. (Appl. 5300/18.)

NITROCELLULOSE is dissolved in isobutyl isobutyrate, solutions up to 33% strength being thus obtainable. The rate of drying of the dope may be increased by the addition of acetone, or similar diluent, or of other esters, such as butyl acetate. The dope can be used on either cotton or linen fabric.

—E. W. L.

Pine resins; Process of and apparatus for distilling crude —. R. Dunwoody, New Orleans, La. U.S. Pat. 1,291,800, 21.1.19. Appl., 12.1.18.

CRUDE gum resin is passed through a number of strainers with meshes of different size, the unstrained portions separated from the strained portions, and the former distilled to separate the rosin. Vapours of the distillate are passed through the strainers to dissolve any gum present, which is then added to the strained portions previously separated.

—C. A. M.

Resin etc. from cellulosic materials. Ger. Pat. 309,555. See XII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENTS.

Balloon envelopes and the like; Fabric for — and method of manufacturing and aftertreating the same. R. Wheatley, and The North British Rubber Co., Ltd., Edinburgh. Eng. Pat. 5915, 20.4.15.

THE layers of rubber or other gas-retaining media employed for coating balloon fabrics are protected from the action of actinic light by incorporating with the coating medium a red, orange, or yellow colouring matter which is soluble in the rubber or other composition employed for coating. For instance, to a dough containing 100 parts of rubber is added a solution of 2 parts of "Oil Red S" dissolved in coal-tar naphtha; or the coated fabric is treated with a solution of "Oil Amber 13777" in coal-tar naphtha by dipping or external application, the dyestuff being absorbed by the rubber.

—J. F. B.

Rubber waste; Process of treating —. Cotton-containing rubber composition. J. F. Johnston, Barberton, Assignor to Electric Rubber Reclaiming Co., Akron, Ohio. U.S. Pats. (A) 1,291,535 and (B) 1,291,536, 14.1.19. Appl., 25.4.18.

(A) RUBBER waste, 100 lb., containing cotton, is heated at about 300° F. (150° C.), with a reclaiming mixture containing a 2% solution of sodium hydroxide, together with resin, 5 lb., and desulphurised petroleum (kerosene), 15 lb., the mixture being agitated. (B) A mass of reclaimed rubber having distributed through it cotton fibre which has been subjected to the action of caustic alkali.

—E. W. L.

Rubber; Process for vulcanising — and products obtained thereby. W. A. Gibbons, Flushing, N.Y., Assignor to New York Belting and Packing Co. U.S. Pat. 1,291,828, 21.1.19. Appl., 30.8.17.

RUBBER or similar material is vulcanised by means of β -dinitroanthraquinone.—C. A. M.

Solvents for rubber. Eng. Pat. 124,072. See IIA.

Coating fabrics. Eng. Pat. 123,551. See V.

XV.—LEATHER; BONE; HORN; GLUE.

Tannins. I. Hamameli-tannin. K. Freudenberg. Ber., 1919, 52, 177—185.

By hydrolysis with tannase in dilute aqueous solution hamameli-tannin yields gallic acid and a sugar (calculated as a hexose) in quantities corresponding with the formula of a digalloylhexose, $\text{C}_{26}\text{H}_{26}\text{O}_{14}$. The sugar appears to contain a normal chain of six carbon atoms. (See also J. Chem. Soc., May, 1919.)—C. S.

Gelatin; Absorption of water by —. E. B. Shreve. J. Franklin Inst., 1919, 187, 319—337.

GELATIN jelly was made by dissolving 20 grms. of selected dried gelatin in 50 c.c. of water or of a desired solution, and allowing the solution to set in a refrigerator either in large flat dishes about 12" diam. or in small dishes about 6 cm. in diam. In the former case the resulting slab of jelly was cut up into discs 2 cm. in diam., 30 of which were used in each experiment; in the latter case a measured quantity of the gelatin solution was taken and the jelly left in the dish throughout

the experiment. Estimation of the amount of imbibed water or solution was made by weighing, more constant results under the same conditions being obtained than by estimating the change of volume, either by a displacement method or by direct measurement. It was found that imbibition invariably increases with rise of temperature. It is suggested that this is not a contradiction of Le Chatelier's theorem, according to which, absorption of water by gelatin being always accompanied by evolution of heat and contraction, it should be favoured by cold and pressure, but that the rate of absorption is so low that equilibrium is never attained, the higher results with increase of temperature being due to higher rates. It is also shown that although the amount of imbibition is less in solutions of sodium sulphate, sodium tartrate, sodium citrate, sodium acetate, alcohol, dextrose, and sucrose than in water, and greater in solutions of potassium, sodium, and ammonium chlorides, and sodium chlorate, nitrate, and bromide, the imbibition of jellies made up with these solutions instead of with water is always greater than that of a jelly made with water only; the same effect is obtained if the water-jelly is allowed to absorb completely a small amount of a solution of any of these substances and is then reduced to its original weight by evaporation.

—B. V. S.

Fission products of horn. Brahm and Zuntz. See XIXA.

PATENTS.

Tanning of hides and skins; Apparatus for the rapid —. F. Gilardini, Turin, Italy. Eng. Pat. 114,631, 5.4.18. (Appl. 5874/18.) Int. Conv., 6.4.17.

THE hide, stretched on a frame, is passed between (say three) successive pairs of superposed planes, each plane being so formed as to constitute a number of cells to which tanning liquor can be supplied under pressure, or in which a reduced pressure of air can be maintained. The cells of the three pairs of planes are so spaced and shaped as to ensure that on its exit from the third pair practically the whole surface of the hide has been in contact with tanning liquor under pressure. The tanning liquor may be supplied to both upper and under plane simultaneously, or it may be supplied to the cells of one plane only, a reduced air pressure being meanwhile maintained in the cells of the other plane of the pair. Automatic valves are provided in the inlet tubes leading to the cells for the purpose of closing the inlets in the event of an air-tight joint between hide and cells not having been made. It is stated that the tanning of each zone of the hide is complete in a few minutes. The successive pairs of planes may be replaced by successive pairs of cylinders with similar cells arranged radially.—E. W. L.

Adhesives; Process of manufacturing waterproof —. S. Buttermann, Madison, Wis., Assignor to United States of America. U.S. Pat. 1,291,896, 14.1.19. Appl., 3.8.18.

A WATERPROOF adhesive consists of casein, 1; water, 2; oil, 0.015; hydrated lime, 0.15, in water 0.90; and sodium silicate 0.70 part by weight.—E. W. L.

Feathers; Manufacture of plastic masses from —. M. Matthaei, Berlin. Ger. Pat. 308,755, 12.12.16.

THE feather material is heated with water under pressure at 140°–160° C., then treated with sulphuric acid and washed with water, after which it is worked up into sheets, rods, etc. either directly or after grinding. The material is rendered resist-

ant to water and acids by this treatment and can be turned and polished like vulcanite, galalith, celluloid, etc. Loading materials as well as sulphur may also be added.—J. F. B.

Grease from water used for washing hides. Eng. Pat. 123,848. See V.

Waterproofing paper etc. Ger. Pat. 309,680. See V.

XVI.—SOILS; FERTILISERS.

Nitric-nitrogen accumulation in the soil; Influence of salts on the —. J. E. Greaves, E. G. Carter, and H. C. Goldthorpe. J. Agric. Res., 1919, 16, 107–135.

A SANDY loam soil was used for the experiments, containing all the elements of plant food in abundance except nitrogen, of which only 0.15% was present. The air-dried soil was divided into 100-grm. portions to each of which was added 2 grms. of dried blood. The salt whose action was to be investigated was added in graduated amounts as a standard solution, and then water to make the moisture content 20%. The sample thus treated was incubated at 28°–30° C. for 21 days, and then the nitric nitrogen determined by reduction with iron and sulphuric acid and distillation of the ammonia. The salts tested were the chlorides, nitrates, sulphates, and carbonates of sodium, potassium, calcium, magnesium, manganese, and iron. It was found that the toxicity of these salts was determined by the specific nature of the salt and not by the ions. In order of decreasing toxicity the salts were: sodium sulphate, sodium carbonate, calcium carbonate, potassium sulphate, potassium carbonate, ferric nitrate, sodium nitrate, magnesium sulphate, ferric sulphate, calcium nitrate, potassium nitrate, potassium chloride, magnesium nitrate, manganous carbonate, manganous chloride, manganous sulphate, ferric carbonate, magnesium chloride, manganous nitrate, ferric chloride, magnesium carbonate, sodium chloride, calcium chloride, calcium sulphate. The increase of toxicity with concentration was much more rapid in some cases than in others. The common alkali salts of soil were very toxic to the nitrifying organisms and greatly reduced the nitric nitrogen accumulation. Most of the salts acted as stimulants to nitrification in some at least of the concentrations used. The only ones which failed to give any stimulation were sodium sulphate and carbonate, calcium carbonate, potassium sulphate and carbonate, and ferric nitrate. Calcium chloride and sulphate increased the nitric nitrogen accumulation 67% and 97% respectively. The nitrates caused loss of nitrogen in some concentrations and fixation of nitrogen in others. Manganous nitrate was the strongest nitrate stimulant.—J. H. J.

Alkali salts in soils; Copper and zinc as antagonistic agents to the —. C. B. Lipman and W. F. Gericke. Amer. J. Bot., 1918, 5, 151–170.

EXPERIMENTS on barley have shown that small quantities of copper or zinc salts are capable of neutralising the toxic effect of comparatively large amounts of alkali salts in soils.

Plants; Influence of organic compounds on the development of —. III. G. Ciamician and C. Ravenna. Atti R. Accad. Lincei, 1919 [v], 28, I., 13–20. (Compare this J., 1918, 598A.)

FURTHER experiments have been made with various compounds related fundamentally to the vegetable alkaloids. (See J. Chem. Soc., 1919, I., 241.)

—T. H. P.

PATENTS.

Superphosphates or like artificial fertilisers; Apparatus for the manufacture of — W. and H. M. Goulding, Ltd., Dublin, and G. H. Allibon, Belfast. Eng. Pats. (A) 123,912 and (B) 123,960, 15.6.18. (Appls. 9855 and 20,597/18.)

(A) A VERTICAL superphosphate den with discharge opening across the bottom (see Eng. Pat. 11,215 of 1906; this J., 1907, 424) is provided with scrapers mounted on a hollow shaft extending upwards above the den and moving downwards by a screw feed during the process of rotation. The discharge opening extends right across the bottom and is provided with vertical sliding doors on each side which divide the den into two compartments with a central free space above the discharge opening. (B) In a vertical den, the sliding doors are operated automatically by the action of scraper feeding mechanism. In a horizontal den, the door which covers the discharge opening is operated automatically by the scraper feeding mechanism.—J. H. J.

Calcium cyanamide fertiliser; Manufacture of a non-dusty — capable of being spread. O. Neuss and H. Stiegler, Essen. Ger. Pat. 298,200, 11.5.16.

PEAT-LITTER is saturated with a salt solution, e.g. the waste liquors from the potash industry, and the resulting slightly moist mass is mixed with crude calcium cyanamide.—J. F. B.

Ammonium nitrate; Process for the manufacture of non-hygroscopic — [for use as fertiliser]. Badische Anilin u. Soda-Fab., Ludwigshafen. Ger. Pat. 309,668, 25.3.16.

A SOLUTION containing ammonium nitrate mixed with potassium chloride is evaporated, preferably at a low temperature. A mixture containing equal parts of the two salts is no more hygroscopic than Chili saltpetre, for instance, whereas pure ammonium nitrate is difficult to apply as a fertiliser because it is deliquescent in the air.—J. F. B.

Fertiliser [; Sewage sludge —]. G. J. Fowler and G. Mumford, Manchester. U.S. Pat. 1,294,080, 11.2.19. Appl., 1.6.16.

See Eng. Pat. 8897 of 1915; this J., 1916, 1074.

Waste acids from nitrocellulose. Ger. Pat. 309,936. See XXII.

XVII.—SUGARS; STARCHES; GUMS.

[Sugar] cane juice; Filtration of raw — R. S. Norris and W. R. McAllep. Int. Sugar J., 1919, 21, 124.

Raw cane juice can be filtered satisfactorily if 50 grms. of Kieselguhr per litre be added to the liquid. An ordinary Buchner funnel with a 125 cm. paper is used, but under the paper a flat piece of brass gauze is placed, the available surface being thus considerably increased. A litre of juice can thus be filtered in about 5 min., whereas without this treatment the filter is soon obstructed.—J. P. O.

Sucrose; Action of neutral salts on the inversion of — by acids. H. Collin and M. Lebert. Bull. Assoc. Chim. Sucr., 1918, 36, 14–17.

THE authors studied the inhibitive action of alkali salts of acetic, citric, and oxalic acids on the hydro-

lytic activity of the free acids. The experiments were in all cases carried out at 90° C. with 7.7% sucrose solutions. Whilst N/2 acetic acid effected complete hydrolysis in 1 hour, it was without any action whatever during the same period in presence of N/2 sodium acetate. Similarly N/2 citric acid produced complete inversion in 15 mins. but was rendered quite inactive by the presence of N/2 sodium citrate. With N/20 oxalic acid inversion was complete in 15 mins. but no action took place in presence of N/5 potassium oxalate during the same period. It is known that the activity of strong acids, such as hydrochloric acid, is not diminished but slightly increased by the presence of their salts. In hydrolysis by hydrochloric acid, however, strongly marked inhibitive effects were found to result from the addition of acetate, citrate, or oxalate in quantities more than equivalent to the free acid present; in such cases the strong mineral acid is entirely replaced by the weak organic acid and the activity of the latter is diminished or entirely suppressed by the presence of its own salt.—J. H. L.

Striegler's reagent [for removing excess of lead from clarified molasses]; Composition of the precipitate produced in the preparation of — G. P. Brouwer. Archief Suikerind. Nederl.-Ind., 1918, 26, 1909–1912.

PREVIOUS to determining the reducing sugars in cane molasses, it is generally necessary to clarify with lead acetate, the excess of the reagent being removed by the addition of a suitable salt. Striegler's reagent (Tervoooren's "Handboek," p. 341), which is used in Java for removing the excess of lead after clarifying molasses with lead acetate, is prepared by dissolving 25 grms. of oxalic acid in 250 c.c. of water, neutralising with sodium carbonate, making up to 500 c.c., and filtering off the precipitate formed. Tervoooren states that this precipitate is sodium bicarbonate, but experiments carried out by the author show that when sodium carbonate is added to oxalic acid under the conditions specified, two precipitates are successively formed, first, sodium binoxalate, which re-dissolves on continuing the addition of sodium carbonate, and, second, sodium oxalate, part of which later dissolves on making up the liquid to 500 c.c. with water. It is concluded that the reagent consists of a saturated solution of normal sodium oxalate, containing a small quantity of sodium bicarbonate, and a slight excess of sodium carbonate.—J. P. O.

Cupric-sodium hydroxide reagent; Preparation of — for use in the detection and determination of sugars. E. Justin-Mueller. J. Pharm. Chim., 1919, 19, 18–20. (See this J., 1919, 11A.)

A REAGENT, which may be used in place of Fehling's solution, is prepared by adding 20 c.c. of 10% copper sulphate solution slowly to 100 c.c. of 33.69% sodium hydroxide solution. This solution remains clear when kept and does not give a precipitate of cupric oxide when boiled.—W. P. S.

Carbohydrates of lichens. Salkowski. See XVIII.

PATENTS.

Lævoglucozan; Manufacture of — A. Pictet. Geneva. Eng. Pat. 121,725, 20.8.18. (Appl. 13,530/18.) Int. Conv., 27.12.17.

LÆVOGLUCOSAN, which can be converted into alcohol by hydrolysis and fermentation, is produced by the dry distillation of carbohydrate materials, e.g.

cellulose, sawdust, or starch, under reduced pressure. (*Cp.* this J., 1918, 49 A.)—J. H. L.

Adhesive [from lupin seeds]; Process of manufacturing an —. H. Thoms and H. Michaelis, Berlin. Ger. Pat. 309,650, 7.9.17.

POWDERED shells of lupin seeds are heated gradually to about 100° C. with water or very dilute solutions of calcium hydroxide or calcium salts, and the resulting extract is evaporated to the consistency of fish-glue. The galactans of the lupin seeds are extracted and modified by partial hydrolysis during the treatment, giving an excellent adhesive which serves as a substitute for starch paste or gum arabic or for finishing yarns and textiles and sizing paper. The seed hulls are more suitable than the entire seeds for this treatment and the kernels may be utilised as foodstuffs. —J. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Diatatic power [of malt]; Determination of —. L. C. Wilson and A. L. Minchin. J. Inst. Brew., 1919, 25, 65–67.

The authors have found that in determining the diastatic power of malt by the method published by the Committee of the Institute of Brewing (this J., 1906, 237) it is unnecessary to extract the 25 grms. of malt for 3 hours, as prescribed; equally high results are obtained by 1 hour's extraction. —J. H. L.

Yeast; Flocculent and powdery forms of —: *their causes.* F. Schönfeld and H. Krumhaar. Woch. Brau., 1918, 36, 302–304, 342–343.

ADDITION of mineral acids or their salts is known to transform yeast from the flocculent to the dispersed or powdery form. The authors found that by adding N/10 hydrochloric acid to a flocculent suspension of yeast in distilled water, until the flocks were dispersed, and then filtering, the filtrate on treatment with alkali yielded a precipitate consisting chiefly of protein, together with lime and phosphoric acid in proportions corresponding approximately to dicalcium phosphate, CaHPO_4 . On treating a suspension of a powdery distillery yeast in distilled water, with a small quantity of N/10 monocalcium phosphate, and then adding N/10 sodium hydroxide drop by drop, flocculation occurred long before the liquid was alkaline to phenolphthalein. It is concluded that the formation of insoluble dicalcium phosphate can bring about flocculation. The fact that calcium hydroxide and calcium salts of very weak acids have a similar effect is attributed to the formation of dicalcium phosphate in the neighbourhood of the yeast cells owing to the exosmosis of phosphate ions from the cells. All cases of flocculation, however, cannot be explained by the action of calcium phosphate, and in some the change is probably brought about by proteins. If a suspension of yeast is treated with N/10 sodium hydroxide and filtered, the filtrate on acidification yields a precipitate consisting almost entirely of protein, which has a very strong flocculating action on yeast. If, for example, a suspension of a powdery distillers' yeast, in distilled water, is treated with an alkaline solution of the precipitate, and then acidified, the yeast flocculates strongly. Yeast from hopped worts yields a much larger quantity of the precipitate than yeast from sweet worts, and its colour is much darker, owing doubtless to the presence of resins and tannin. It is probable that in brewery fermentations, wort proteins which separate from solution, especially as

the acidity of the wort increases, and are deposited on the yeast cells, exert this flocculating tendency, but where the yeast peptase is able to decompose the deposited proteins the yeast may retain its powdery form. Lange has observed that powdery yeasts are characterised by high peptic activity.—J. H. L.

Beers: Air in gas used for carbonating —. A. R. Ling. J. Inst. Brew., 1919, 25, 173–174.

It is well known that the aeration of worts at an early stage of fermentation is beneficial to yeast reproduction; but beyond the point at which attenuation has reached half gravity, it is actually harmful (*cp.* Ling, this J., 1915, 1159). When air gains access to the wort in the fermenting vessel at a late stage of the fermenting process, some of the cells are carried back to that phase of development which they should assume at pitching, and reactions other than alcoholic fermentation, which are necessary for the development of character, are brought to a standstill. A yeast from an aerated wort shows a number of budding cells which should never be present except in small quantity, in a good pitching yeast. In connection with chilled, filtered and carbonated bottled ales, even when the most efficient filters and pulp are used, it is impossible to remove all the yeast cells and other organisms present in the beer. Nor would this be desirable, for if anything approaching ultrafiltration were practised, colloidal particles might also be removed, which are known to help in maintaining character and condition. The point to which the author calls special attention, however, is that if the beer is to remain bright for a reasonable period, the smallest trace of air must not be allowed to gain access to it. If air is introduced with the gas used for carbonating the beer, a small number of yeast cells, which under strictly anaërobic conditions would remain dormant, will multiply to such an extent that the beer throws a deposit, and may even become turbid. The precaution against this is to test every batch of carbon dioxide used for carbonating beer for the presence of air. A sample of carbon dioxide should not contain more than one part of air in a thousand.

Beers: Light — and yeast reproduction. H. B. Wooldridge. J. Inst. Brew., 1919, 25, 171–173.

THE author describes the results of varying the proportion of pitching yeast, in the production of English light beers. When the present low-gravity beers first became compulsory, experiments were made by pitching bitter ales of sp. gr. 1.035 with $\frac{1}{2}$ lb. of yeast per finished barrel, and mild ales and porters of sp. gr. 1.030 and 1.025 with 1 lb. per barrel. The yeast crops obtained were actually less in amount than the yeast added at pitching, and were so weak as to be unfit for further use. By reducing the amount of pitching yeast to one half those mentioned above much better results were attained. With bitter ales a crop amounting to 3 times the quantity of pitching yeast was obtained, and with mild ales of sp. gr. 1.030 the increase was between 4- and 5-fold. Moreover the yeast obtained was solid and vigorous and remained fit for pitching even 5–6 days after being skimmed.—J. H. L.

Yeast reproduction; Light beer and —. T. Bokorny. Allg. Brauer- u. Hopfenzeit., 1917, 57, 1327. Z. ges. Brauw., 1918, 41, 210. (See also this J., 1918, 162 A.)

IN experiments with yeast and pure sugar solutions multiplication of the yeast was found to be influenced by the relative proportions of yeast and sugar present, by the temperature, and by the absolute concentration of sugar. With 0.01 grm. of pressed yeast and 1 grm. of sugar, reproduction

proceeded rapidly even in absence of air, but with 1 grm. of yeast and 1 grm. of sugar practically no reproduction occurred. Lowering of the temperature had a much more adverse effect on reproduction than on fermentation. As regards the absolute concentration of sugar, 6% solutions were found to be more favourable to reproduction than 3%, 5.4%, 7%, or 8% solutions.—J. H. L.

Yeast; Nutrition of — in light beers. F. Schönfeld and H. Krumhaar. *Woch. Brau.*, 1918, 33, 213–214.

In spite of the low gravity of present-day German beer worts the yeast is capable of retaining its vigour and well-nourished condition throughout a number of successive fermentations. The protein-content remains normal or even increases, probably in consequence of relatively restricted reproduction and movement in light worts. The total content of mineral matter also remains normal, although the proportion of phosphoric acid to lime and magnesia is high. The acidity of the yeast is also higher than that of yeasts from normal worts.—J. H. L.

Beers; Effects of artificial carbonation of light —. F. Schönfeld. *Tageszeit. für Brau.*, 1918, 16, 673, 675. *Z. ges. Brauw.*, 1919, 42, 13–14.

In the production of very light (German) beers artificial carbonation has often been found to result in lessened stability and in the appearance of haze due to hop-resins, tannins, or proteins. In very light worts the separation of these imperfectly dissolved colloidal constituents before or during fermentation is apt to be incomplete, and a certain proportion remains in a state of unstable solution and may separate in a very finely divided form as the result of carbonation. Light beers produced by dilution of heavier fermented worts are abnormally sensitive to carbonation, for the dilution disturbs the equilibrium between the colloidal wort constituents and renders some of them readily precipitable. Possibly dilution with water saturated with carbon dioxide might avoid this to some extent. It is advisable to allow light beers to remain under a pressure of carbon dioxide for some days after carbonation, to ensure the complete separation of all substances precipitable by carbon dioxide, before filtration. Cases of iron-sickness in light beers (*cf.* Windisch, this J., 1918, 779 A) have been traced to the use of carbon dioxide from iron containers which had rusted inside owing to the presence of moisture. (See also Lindner, this J., 1919, 87 A.) —J. H. L.

Glycerol; Preparation of — by fermentation. K. Schweizer. *Helv. Chim. Acta*, 1919, 2, 167–172.

A YIELD of glycerol, amounting to about 21% of the sugar used, may be obtained by fermenting with a hardy species of pressed yeast in the presence of a considerable quantity of sodium sulphite, free aeration of the mixture being of course prevented. It is stated that some of the belligerents employed this method on the large scale during the war. (See also J. Chem. Soc., 1919, i., 239.)—J. C. W.

Fumaric acid fermentation of sugar. F. Ehrlich. *Ber.*, 1919, 52, 63–64.

THE formation of free fumaric acid during the fermentation of sugar (Wehmer, *Ber.*, 1918, 51, 1663) has been previously observed by the author (*Ber.*, 1911, 44, 3737).—C. S.

Wines; Analyses of old —. W. I. Baragiola and O. Schuppli. *Helv. Chim. Acta*, 1919, 2, 173–181. The results of exhaustive chemical and physical tests of an 1834 Yvorne and an 1840 Glacier wine are given.—J. C. W.

Wine, cider and other beverages obtained from fruit; Food value of the by-products and refuse in the preparation of —. F. Honcamp and E. Blanck. *Landw. Versuchs-Stat.*, 1919, 92, 275–290.

FEEDING experiments on sheep indicate that the dried refuse from apples and pears obtained in the preparation of beverages from these fruits constitutes an excellent cattle-food. The actual value varies according to the proportion of pips and stalks present in the refuse. The dried skins of grapes, however, have an inferior feeding value, a relatively small proportion being digested and absorbed by the animal.—H. W. B.

Alcoholic fermentation; Carbohydrate content of lichens and the influence of chlorides on —. E. Salkowski. *Z. physiol. Chem.*, 1919, 104, 105–128.

ANALYSES of Iceland moss and reindeer moss (*Cladonia rangiferina*) are given. The sugar obtained by acid hydrolysis of these lichens is fermentable. Chlorides may exert an inhibiting influence on alcoholic fermentation. Lichenin is not converted into sugar by plant diastase or by the diastatic enzymes of the pancreas and saliva. —J. C. D.

Fractional distillation [of alcohol-water mixtures]; Thermodynamics and —. C. Mariller. *Bull. Assoc. Chim. Sucr.*, 1918, 35, 45–51.

THE statement of Chenard that in vaporised mixtures of alcohol and water the lower layers become richer in alcohol than the upper ones owing to the higher density of alcohol vapour as compared with water vapour (this J., 1916, 293), is contrary to the general properties of gaseous mixtures. The author repeated Chenard's experiments, but found no evidence of any such layers of different composition, provided disturbing effects due to cooling and partial condensation of the vapours were avoided.—J. H. L.

Inversion of sucrose. Colin and Lebert. See XVII.

Nitrogen distribution in [yeast]. Eckstein and Grindley. See XIXa.

Asphodel tubers. Savini. See XIXa.

Nucleotides. Thannhauser and Dorfmueller. See XX.

PATENTS.

Acids of the fatty series; Manufacture of — and of butyric acid in particular [by fermentation]. L. Lefranc, Paris. Eng. Pat. 17,776, 27.7.14.

FATTY acids are produced from materials containing carbohydrates, *e.g.*, beetroots, molasses, potato pulp, etc., by fermenting the sterilised material by means of bacteria previously cultivated in material of the same kind, and by employing simultaneously two types of bacteria, one, like the *Amylobacter* or *Clostridium* type, capable of acting upon sugars, cellulose, and proteins, and the other, like the *B. amylozyme* of Perdrix, capable of acting on starch. The fermentation is conducted in presence of calcium or magnesium carbonate, at 38°–39° C., in closed vats or under a protective layer of carbon dioxide. After fermentation and filtration, the filtrate may be concentrated in multiple effect apparatus until calcium butyrate begins to crystallise from the hot liquid.—J. H. L.

Bacterial fermentation of carbohydrates and bacterial cultures for the same. [Manufacture of acetone and butyl alcohol.] C. Welzmann, Manchester. Eng. Pat. 4845, 29.3.15.

Solutions or suspensions of materials rich in starch or other carbohydrates are fermented under aerobic or anaerobic conditions, by means of heat-resisting bacteria obtained from soil or cereals, characterised by ability to liquefy gelatin and to convert starch mainly into acetone and butyl alcohol under aerobic or anaerobic conditions. A mash of malze, for example, previously cooked under pressure and containing 1 part of maize to 15 parts of water, may be fermented, preferably under anaerobic conditions, at 35°–36° C. In preparing the organisms, a large number of tubes of sterile maize mash are inoculated with suitable material, such as maize meal; after 4–5 days at 35°–37° C. those showing the most vigorous fermentation and having a pronounced odour of butyl alcohol, are heated for 1–2 mins. at 90°–100° C. and used for the preparation of a series of consecutive sub-cultures each of which is similarly heated before re-inoculation into fresh maize mash. The organisms finally surviving probably consist chiefly of *B. granulobacter pec-tinovorum*.—J. H. L.

Lactoglucosan. Eng. Pat. 121,725. See XVII.

XIXA.—FOODS.

Milk; Significance of the colon count in raw ——. S. H. Ayers and P. W. Clemmer. U.S. Dept. Agric., Bull. No. 739, 1918, 1–35.

The colon count as made at present includes the *B. aerogenes* as well as the *B. coli*. Since the *B. aerogenes* is principally of non-faecal origin, the colon count cannot be a direct measure of faecal contamination. Investigation showed that fresh milk, produced under clean conditions, usually contained a few colon-aerogenes bacilli, and if produced under dirty conditions contained up to 2000 per c.c. The colon count therefore in fresh milk (under 2 hrs. old) will indicate the conditions under which the milk has been produced. In milk kept below 10° C. the colon-aerogenes group did not multiply, but above this temperature growth was very rapid. The colon count in milk of unknown origin has no definite significance: counts below 2000 per c.c. indicate either the number of organisms originally present or growth from a smaller number of organisms; counts above 2000 per c.c. indicate growth and that the milk has been at some time above 10° C.—J. H. J.

Milk; Analysis of—, especially the determination of lactose. H. Salomon and R. Diehl. Ber. Deuts. Pharm. Ges., 1918, 28, 493–498.

The poor fodder available in Germany during the war does not appear to have affected the quality of the milk yielded by cows; results of analyses show that the milk contains normal quantities of fat, proteins, albumin, and lactose. With regard to the determination of lactose, treatment with copper sulphate and sodium hydroxide solutions does not always remove all proteins, particularly when the milk has been preserved with formaldehyde; the proteins may, however, be precipitated completely by boiling the milk after the addition of zinc sulphate, by treatment with copper sulphate alone, or by means of a solution containing asaprol (calcium β -naphthol- α -monosulphonate), 15, and citric acid, 15 grms. per 500 c.c. of water.—W. P. S.

Milk; Determination of the non-protein nitrogenous constituents of ——. W. Denis and A. S. Minot. J. Biol. Chem., 1919, 37, 353–366.

The total non-protein nitrogen is estimated by a micro-Kjeldahl method after the proteins, fat, and

lactose have been removed by precipitations with copper reagents. Urea may be estimated directly in milk by the urease method. The colorimetric method for the estimation of creatine and creatinine may be applied to milk after the removal of protein, fat, and lactose. Amino-nitrogen is determined by the Van Slyke method (this J., 1911, 771, 1135; 1915, 1110) after removal of protein. Uric acid is estimated by precipitation as the zinc salt and subsequent application of the colour reaction with the reagent of Folin and Denis. (See further J. Chem. Soc., May, 1919.)—J. C. D.

Galapiezometer [apparatus for measuring the pressure of gases in tinned foods]. G. A. Le Roy. Ann. Falsif., 1919, 12, 34–35.

To determine the relative pressure of gases in "blown" tins of food (e.g., condensed milk), the tin is placed in a small vessel provided with an airtight cover; an opening in the cover is closed by a rubber stopper through which pass a thermometer, a tube with a three-way tap, and a sharp pointed metal rod. The three-way tap is connected with a mercury manometer which measures the pressure produced when the tin is pierced by the metal rod and the gases liberated.—W. P. S.

Straw and wood; Acid and alkaline digestion of—and the valuation [as foodstuffs] of straw and wood meals. A. Jonscher. Z. öfentl. Chem., 1918, 24, 279–283.

Straw and wood, chiefly larch wood, have been recommended as foodstuffs for animals and even for human consumption. They are prepared either as raw meals (mechanical pulps) or after preliminary treatment, e.g., with hydrochloric acid or caustic soda. The author has examined samples of straw meal, both raw and hydrolysed with hydrochloric acid. The normal treatment with acid gives a brownish-yellow fine powder; more severe treatments give light brown and dark brown products. Comparative examination of these and of raw straw showed that the product prepared by the normal treatment was by far the best. Calculated on the straw dry substance, raw straw gave 12.78% of matters soluble in water, whereas the product of the normal acid treatment gave 28.70%, 10.77% being sugar. Stronger acid treatments gave products with caramelised flavour, with no substantially increased solubility and with much of the sugar destroyed. Acid treatment made no appreciable difference in the percentage of crude cellulose (41.08–43.54%) nor in that of the mineral matter (6.21–6.37%). The normally hydrolysed straw is capable of serving as a fodder for ruminants, but it contains too much resistant cellulose for human consumption. Beech wood meal, after hydrolysis with hydrochloric acid, showed an aqueous extract of 21.24% and was quite as unsuitable for human consumption as the hydrolysed straw. By treatment with caustic soda the straw is modified in a different manner. The fat or wax and most of the silica are removed and the digested straw is brought into a soft condition more favourable to assimilation by ruminant animals, but loss of extractive matters is involved by the necessity of removing and washing out the alkali. This form of straw is prepared as a moist pulp and in that condition can be used as an adjunct to other fodders. It contains 60.5% of crude cellulose as against 42.5% in the raw straw and is therefore still less suitable than the latter for human food.—J. F. B.

Feeding stuffs; Reduction of the quantity of humin nitrogen formed in the hydrolysis of the nitrogenous constituents of ——. H. C. Eckstein and H. S. Grindley. J. Biol. Chem., 1919, 37, 373–376.

The application of the Van Slyke method for determining the distribution of nitrogen in proteins (this

J., 1911, 771, 1135; 1915, 1110) to the analysis of feeding stuffs has been difficult owing to the production of large amounts of humin matter during the hydrolysis. This difficulty has now been surmounted with apparent success. A process is described by which certain interfering substances may be removed prior to the hydrolysis, whilst a large proportion of the protein of the foodstuff is removed and hydrolysed separately. (See further J. Chem. Soc., May, 1919.)—J. C. D.

Nitrogen in certain seeds [and yeasts]; Determination of the distribution of — J. F. Brewster and C. L. Absberg. J. Biol. Chem., 1919, 37, 367—371. (Compare J. Chem. Soc., 1915, 1, 760.)

YEAST nucleic acid when analysed by the Van Slyke method for the determination of the distribution of nitrogen in proteins (this J., 1911, 771, 1135; 1915, 1110) yields 15% of its nitrogen in the arginine fraction, although it contains no arginine. The application of the Van Slyke method to the analysis of products containing nucleic acid may therefore lead to erroneous results. (See further J. Chem. Soc., 1919, 1, 239.)—J. C. D.

Asphodel tubers; Utilisation of — G. Savini. Annali Chim. Appl., 1919, 11, 1—5.

THE tubers of *Asphodelus ramosus* contain inulin (9.6—17.5%) and may either be saccharified by means of dilute acid and fermented to obtain alcohol or be subjected to pressure, the resultant juice being then evaporated to a syrup, which has the external characters of malt extract and possesses comparatively high nutrient qualities. —T. H. P.

Horn; Value of the fission products of — as nutrient and food stuff. C. Brahm and N. Zuntz. Deut. med. Woch., 1917, 43, 1062—1063. Chem. Zentr., 1919, 90, II., 66—67.

THE component groups of keratin are in the main the same as those of the animal and plant proteins, but the indigestible horn differs from the easily digestible proteins in that it contains considerably more cystine. On account of its richness in this and in aromatic groups (phenylamine and tyrosine), horn would appear to be particularly suitable for increasing the food value of nitrogenous substances, such as glue, which are almost devoid of these groups. The authors have confirmed the fact that equal quantities of nitrogen in the form of glue have a far lower value than in the form of true animal and vegetable protein. Moreover, glue preparations exert a positively injurious action on the organism. Experiments were started with partially hydrolysed horn substance, of which 24.37% could be extracted with water. The dissolved substance contained 8.8% of nitrogen, equivalent to 15.5% of the total nitrogen of the horn. Thus, the first products of hydrolysis consist of the less highly nitrogenous components of the horn, that is, amino-acids of high molecular weight. The administration of this extract to dogs previously fed on glue produced complete recovery, and from a diet containing 10% of horn extract on the weight of the glue, the animals were able to derive full nitrogenous nutrition. Further experiments with more completely hydrolysed horn led to the preparation of an extract with an agreeable flavour of meat extract which, in the proportion of 10% of the total nitrogen of the mixture, sufficed to impart to a glue diet the full equivalent nutrient value of protein. Larger quantities of horn extract, e.g., 33.3% of the total nitrogen of the mixed horn and glue diet, were not so successful, the mixture proving unpalatable, but the albuminuria induced by a glue diet was always promptly cured.—J. F. B.

Egg albumin; Distillation of — under reduced pressure. A. Pictet and M. Cramer. Helv. Chim. Acta, 1919, 2, 188—195.

THIS work was undertaken in order to throw light, if possible, on the origin of the aniline, pyridine, and quinoline found in animal oils, since these bear no known relationship to the proteins. Egg albumin, distilled under 22 mm. pressure, gives a very porous coke (32%), much water and gases, and only 15% of volatile organic compounds. These include the lower fatty acids and succinic acid, a primary base which may be a dihydroaniline, pyrric bases, indole, but chiefly isocaproamide. The isolation of this amide shows the origin of the isocaproitrile which is one of the main ingredients in ordinary animal oil. (See further J. Chem. Soc., 1919, 1, 227.)—J. C. W.

Food value of wine-making residues etc. Honcamp and Blanck. See XVIII.

PATENTS.

Bread and other food products, and process of producing same. R. Graham, Cupar, Fife. Eng. Pat. 123,883, 25.4.18. (Appl. 6971/18.)

A FOODSTUFF for addition to cereal flour is prepared as follows:—Dried edible tubers, such as potatoes, are ground to a flour and mixed with a proportion of malted cereal and warm water; the temperature of the mass is slowly raised to 145° F. (63° C.) and then quickly to 212° F. (100° C.), and kept at that point for $\frac{1}{2}$ —1 hr. until complete gelatinisation and conversion of starch has been effected, when it is lowered to 160° F. (71° C.). The tubers may be used also in their original state. To 61% of the malted material an equal amount of fine white flour and a little yeast are added, and the mass is kept at 75° F. (24° C.) for $\frac{1}{2}$ hrs. To the remaining 39% of the malted material is added more malted cereal, and the mixture is kept at 160° F. (71° C.) for $\frac{1}{2}$ hr., when second-grade flour and yeast are added, and the mass kept at 80° F. (27° C.) for $\frac{1}{2}$ hr. The two sponges thus produced are kneaded together with salt to form a dough which is then baked. A whole-meal bread may be prepared in a similar manner.—J. H. J.

Grain; Method of treating — for the preservation thereof, and apparatus employed in connection therewith. C. West, London. Eng. Pat. 123,925, 24.8.18. (Appl. 13,811/18.)

A SMALL proportion of the grain to be treated is slightly crushed, in order to release a small amount of gluten, and is then mixed with the main portion, the whole being sterilised at 140°—210° F. (60°—99° C.) by steam. After sterilisation the grain is fed into moulds on the rotating table of a hydraulic press where it is compressed into blocks and discharged on to an endless band conveyor in readiness for storage or transit.—J. H. J.

Potatoes; Manufacture of readily digestible, preserved —. E. E. Wever, Barmen-Rittershausen. Ger. Pat. 309,446, 2.10.17.

POTATOES are cooked in their own moisture, then cut up finely and passed alternately over cold and hot surfaces whereby they are reduced to a pulp and partially dried, after which the mass is fully dried in the usual way.—J. F. B.

Baking powder; Preparation of a durable —. K. F. Töllner, Bremen. Ger. Pat. 309,712, 14.4.17.

A CARBONATE is mixed with the finely powdered dried peel of *Aurantiaeca*, such as lemons or oranges, which is used instead of the acid or acid salts

commonly employed. Part of the sodium bicarbonate is preferably replaced by magnesium carbonate. The action of the peel is attributed to the aldehydes, such as citral, and the terpenes contained therein, which form resins and acids during the drying of the peel.—J. F. B.

Baking powders, lemonade powders, etc.; Preparation of —. O. Börner, Berlin-Stidende. Ger. Pat. 309,933, 2.9.17.

THE acids and acid salts usually employed are replaced either wholly or in part by urea phosphate. —J. H. J.

Bread; Manufacture of a concentrated —. C. A. Heudbert, Nanterre, France. U.S. Pat. 1,293,772, 11.2.19. Appl., 25.10.16.

SEE Eng. Pat. 107,192 of 1916; this J., 1917, 1191.

XIXb.—WATER PURIFICATION; SANITATION.

Concentration of smokes. Disappearance of smoke. Tolman and others. See I.

PATENTS.

Water-softening material; Method of producing —. G. H. Widner, Des Moines, Iowa. U.S. Pat. 1,294,007, 11.2.19. Appl., 10.3.17.

SEE Eng. Pat. 116,023 of 1917; this J., 1918, 440 A.

Extracting grease. U.S. Pat. 1,293,738. See XII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloids and adrenaline; Application of Grimbart and Leclère's apomorphine reaction to —. G. Denigès. Bull. Soc. Pharm., Bordeaux, 1918, 46, 183. J. Pharm. Chim., 1919, 19, 49.

THE reaction described by Grimbart and Leclère for apomorphine (this J., 1915, 150) may be applied to morphine and adrenaline. A characteristic green coloration is obtained when a few mgrms. of morphine are heated with 3 drops of sulphuric acid until browning occurs, the mixture then treated with 5 c.c. of saturated sodium acetate solution and 2 drops of 4% mercuric chloride solution, and boiled. Pyrocatechol gives a red-violet coloration when boiled with sodium acetate and mercuric chloride solutions; the colouring matter is soluble in ether, chloroform, and particularly easily in amyl alcohol. Adrenaline (methyl-amino-propanol-pyrocatechol) gives a red coloration when treated with the reagents in the cold; if the mixture is heated above 50° C., the coloration may disappear if only a small quantity of adrenaline is present. The reaction is given by as little as 0.01 mgrm. of adrenaline.—W. P. S.

Saponins. I. E. Winterstein and M. Maxim. Helv. Chim. Acta, 1919, 2, 195—203.

A PRELIMINARY account of an investigation into the nature of saponins and their hydrolytic products, the sapogenins. The saponin of the soap-berry (*Sapindus saponaria*) appears to be a mixture of glucosides which is partially hydrolysed to a mixture of pentosides ("initial sapogenins") by cold acids and then to a compound, $C_{14}H_{24}O_8$, m.pt. 219° C., by warm acids. This "end sapogenin" resembles the resins in many respects and gives naphthalene derivatives on oxidation. (See further, J. Chem. Soc., 1919, i., 214.)—J. C. W.

Nucleotides; Cleavage of — by means of hot picric acid solution. *Isolation of crystalline cytidine-phosphoric acid. Experimental studies on nucleic metabolism.* VI. S. J. Thannhauser and G. Dorfmueller. Z. physiol. Chem., 1919, 104, 65—72.

HYDROLYSIS of triphosphonucleic acid from yeast with hot picric acid yields cytidine-phosphoric acid which may be isolated in the form of the brucine salt, $C_{12}H_{14}O_8N_3P(C_{23}H_{25}O_2N_3)_2$, m.pt. 180°—182° C. The free cytidine-phosphoric acid, $C_8H_{10}O_8N_3P$, crystallises in monoclin-spheroidal crystals, m.pt. 227° C., $[\alpha]_D^{20} = +23.43^\circ$.—J. C. D.

Polymethylcyclohexenones of the irone type; Preparation of —. L. Ruzicka. Helv. Chim. Acta, 1919, 2, 144—161.

IN order to synthesise perfumes of the type of irone, it would seem desirable to set out from cyclohexenones in which the double bond is already in the right position, rather than to leave ring closure to a more advanced stage. Cyclohexenones of the desired type have been synthesised as follows: β -ketonic esters are condensed with α -bromoisobutyric ester by Reformatsky's method. The lactonic esters so formed are converted into unsaturated dicarboxylic acids or their esters by boiling with alcoholic hydrobromic acid, and the latter are condensed to cyclohexenones. The last stage is, however, so difficult of achievement on any satisfactory scale that further developments of the synthesis seem to be hopeless. (See further J. Chem. Soc., 1919, i., 209.)—J. C. W.

Linalool; Synthesis of —. L. Ruzicka and V. Fornasir. Helv. Chim. Acta, 1919, 2, 182—188.

METHYLHEPTENONE, from citral (Verley, this J., 1897, 351), is dissolved in ether, mixed with sodamide, and submitted to a slow stream of acetylene when a good yield of dehydrolinalool, $(CH_3)_2C:CH.(CH_2)_2.CCH_2(OH).C:CH_2$, is obtained. This is reduced to linalool by shaking with sodium and moist ether. (See further, J. Chem. Soc., 1919, i., 193.)—J. C. W.

Wood of Juniperus oxycedrus and other conifers; Dry distillation of —. R. Huerre. J. Pharm. Chim., 1919, 19, 33—42, 65—79. (See also this J., 1915, 1164.)

THE oil of cade was prepared by the distillation of the wood of *Juniperus oxycedrus*; a similar oil was also prepared by distilling the wood after the essential oil had been removed. The first oil contained 5% of substances soluble in dilute sodium hydroxide solution, whilst the other oil contained 10%. The portions of the oils insoluble in sodium hydroxide solution had the following characters:—Oil of cade: 60% distilled between 250° and 300° C.; saponif. value, 78; iodine value, 103.12. Oil from wood freed from essential oil: 50% distilled between 250° and 300° C.; saponif. value, 89; iodine value, 115.30. The oil of cade was the more volatile when steam-distilled, and the volatile portions also showed slight differences in their analytical values. *Oil of Virginian cedar (Juniperus virginiana)*: The portion of this oil insoluble in dilute sodium hydroxide solution had an iodine value of 116.33, and 50% distilled between 250° and 300° C. *Oil of Lebanon cedar (Cedrus Libani)*: 20% distilled between 200° and 250° C. and 60% between 250° and 300° C.; these two fractions had iodine values of 91.69 and 93.72, respectively.—W. P. S.

Acetaldehyde; Synthesis of — from acetylene.

T. Shoji. Kogyō-Kwagaku Zasshi (J. Chem. Ind., Tokyo), 1919, 22, 28—42.

A 2% solution of mercuric oxide in 25% sulphuric acid is found to be the best absorbent of acetylene,

the yield of acetaldehyde being 80–84%. The solution should be warmed at first but subsequently no external heating is necessary.—J. C. W.

Formaldehyde; Polymerisation of — by alkalis. C. Mannich. Ber., 1919, 52, 160–162.

α -POLYOXYMETHYLENE has been obtained in 43% yield by keeping for 4 months a 30% solution of formaldehyde (almost free from methyl alcohol) containing 4% of anhydrous sodium carbonate. The presence of methyl or ethyl alcohol diminishes the yield. (See also J. Chem. Soc., 1919, i., 196.)—C. S.

Acids from petroleum derivatives. Wegzyn. See IIa.

PATENTS.

Diethyl and dimethyl ketones; Manufacture of —. N. V. Sidgwick and B. Lambert, Oxford. Eng. Pat. 14,085, 5.10.15.

A PRACTICALLY quantitative yield of acetone or diethyl ketone may be obtained by passing the vapour of acetic or propionic acid over manganous oxide at 350° C. The acid may be used in its concentrated form or diluted to 20% strength with water. The catalyst is prepared by boiling pumice stone in a strong aqueous solution or suspension of manganous acetate or carbonate, and continuing the boiling until all the water is evaporated, but the temperature must not be allowed to rise above 200° C. at this stage unless air is excluded.—W. G.

Tanno-casein compound, and a process for the manufacture of the same. B. Abrahamsen, Trondhjem, Norway. Eng. Pat. 114,158, 12.3.18. (Appl. 4347/18.) Int. Conv., 12.3.17.

New tanno-casein compounds for medicinal use which are soluble with difficulty in weak acids, water, or gastric juice, but readily soluble in weak alkaline solutions, are prepared by adding a solution of tannin to an alkaline solution of casein, heating the mixture to about 50° C., preferably after the addition of acetic acid to neutralise the alkali, separating the resulting precipitate, and drying first at 50° C., and finally, when most of the water has been removed, at 100°–120° C. The product contains from 40 to 60% of tannin, according to the amount used in precipitating the casein.—G. F. M.

Chlorination; Process of continuous two-phase —. H. T. Boyd, Homer, Ohio, Assignor to Ohio Fuel Supply Co., Pittsburgh, Pa. U.S. Pat. 1,293,012, 4.2.19. Appl., 21.1.18.

LOWER members of the paraffin series of hydrocarbons having more than one carbon atom are treated with chlorine in the liquid phase and the vapours from this chlorination are then treated with chlorine in the vapour phase in a separate reaction chamber.—G. F. M.

Chlorination; Apparatus and process involved in —. K. Brown, Montclair, N.J., Assignor to Condensite Co. of America, Bloomfield, N.J. U.S. Pat. 1,294,230, 11.2.19. Appl., 17.5.17.

TWO or three closed reaction vessels are connected together by pipes leading from the upper portion of one vessel to the lower portion of the next, the upper ends being provided with valves capable of being regulated from the exterior of the vessels. A gas-admission pipe leads to the lower part of the first vessel and an exit pipe from the upper part of the end vessel, and means are provided for forcing the liquid contents of each vessel into the one next preceding it, for introducing different liquids into the second and third vessels respectively, and for heating the vessels.—G. F. M.

Mercury catalysts; Method of regenerating —. H. A. Morton, Pittsburgh, Pa., Assignor to Union Carbide Co., New York. U.S. Pat. 1,293,863, 11.2.19. Appl., 9.4.18.

THE exhausted catalyst is treated with chlorine, mercuric chloride is recovered from the resulting mixture, and re-converted into the desired catalyst.—G. F. M.

Nicotine from tobacco; Method of removing —. R. Sayre and E. Yanovsky, Washington, D.C. U.S. Pat. 1,294,310, 11.2.19. Appl., 16.5.18.

TOBACCO is immersed in an infusion containing all the normally soluble constituents except nicotine, whereby the latter passes into solution. The tobacco is then removed and the infusion pressed out, leaving such an amount adhering to the tobacco as substantially to preserve the normal amounts of the soluble constituents, other than nicotine, in the tobacco. The amount of soluble matter contained in the infusion is determined by the ratio of the amount of solvent used to the amount left adhering to the tobacco, and after each operation the infusion is regenerated for further use by precipitating the nicotine with a reagent containing the tannic acid radical, and adding to it a quantity of water equal to the amount of liquid left adhering to the tobacco.—G. F. M.

Bromoamylbromoisovaleric ester; Preparation of —. E. Rath, Frankfurt. Ger. Pat. 309,455, 8.9.16.

EQUIMOLECULAR quantities of bromoamylene hydrate and bromoisovaleryl bromide or chloride are heated on the water bath in the presence of an indifferent solvent until vapours of hydrogen bromide are no longer evolved. Bromoamylbromoisovalerate is a slightly yellow oil with a faint characteristic odour, somewhat resembling that of valerian root; it can be rectified under vacuum and may be utilised in pharmacy.—J. F. B.

Calcium caseinate; Preparation of a compound of iron glycerophosphate with —. P. Hoering, Berlin. Ger. Pat. 309,843, 11.2.17.

IRON glycerophosphate is dissolved in fresh milk and methyl alcohol is added which produces a light brown, bulky precipitate. The mixture is centrifuged and the sediment washed with methyl alcohol and dried, when it is obtained as a voluminous powder, almost completely soluble in water.—J. H. J.

[Acetone and butyl alcohol.] Eng. Pat. 4845. See XVIII.

Butyric acid. Eng. Pat. 17,776. See XVIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Absorption of water by gelatin. Shreve. See XV.

PATENTS.

Polychrome cinematography. Colour photography. A. Hamburger, London. Eng. Pats. (A) 123,786 and (B) 123,787, 3.12.17. (Appls. 17,881 and 17,882/17.)

(A) IN the production of two-colour cinematograph films where a film coated on both sides is used for the formation of the two positives, both sides are

coloured simultaneously. Three methods are given for carrying out this process—(a) The double film is passed between two bands of absorbent material passing over rollers and kept moistened with the respective dye solutions. (b) The film is passed through a series of clamping frames so arranged as to make liquid-tight connections along the edges of the film and hold the required dye solutions in separate chambers in contact with the film on each side. (c) The film is passed between bands of dyed carbon or gelatin-coated paper. The dyeing operation may be preceded by or combined with a bleaching of the images, a suitable bath being a solution of copper sulphate, potassium bromide, and potassium ferricyanide. A convenient way of combining the bleaching and dyeing operations is by process (c), the dyed carbon or gelatin-coated paper being soaked in the bleaching solution before application to the film. (d) Methods b and c of the preceding patent are applied to single pictures, a special design of frame for process b being described. The method may be extended to three-colour pictures, the two-colour film obtained in this way being combined in register with a third, preferably yellow, positive.—B. V. S.

[Photographic] *light-filter*. H. T. Clarke, Assignor to Eastman Kodak Co., Rochester, N.Y. U.S. Pat. 1,293,039, 4.2.19. Appl., 1.7.18.

A STABLE yellow light-filter, having a sharp-cut absorption in the blue-violet and a sustained absorption in the ultra-violet, is obtained by dyeing gelatin film with sodium glucosephenylsazone-*p,p'*-dicarboxylate. (See also this J., 1919, 118 A.)—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

Primers for explosives; Modern — I. Silver acetylde. A. Stettbacher. Z. ges. Schiess- u. Sprengstoffw., 1916, 11, 1—4. Chem. Zentr., 1919, 90, II., 126—127.

ACETYLENE precipitates from an ammoniacal silver solution a grey-white substance which probably has the composition Ag_2C_2 , whilst the product obtained by passing acetylene through a neutral or slightly acid (nitric) solution of silver nitrate almost certainly contains oxygen and may be a double compound of silver acetylde and silver nitrate. The former product is far inferior to the latter in explosive properties. When heated or ignited it explodes with a dull report with liberation of carbon. Its brisance is low. It does not explode, but dissolves with evolution of acetylene when mixed with concentrated sulphuric acid or fuming nitric acid. It is very sensitive to flame and more sensitive than mercury fulminate to shock and friction. As a detonator it is inferior to mercury fulminate, and has a tendency, moreover, to become extremely sensitive to shock and pressure when in contact with organic nitro-compounds. The products obtained from neutral and slightly acid solutions are apparently identical in their explosive properties. When ignited, they explode with a clear, sharp, report. They have high brisance, and tests made on iron plates show them to be equal to silver fulminate and silver azide. As detonators they do not equal the azides but have four times the power of mercury fulminate.—T. St.

Mercury fulminate and some of its impurities. P. Nicolardot and J. Boudet. Bull. Soc. Chim., 1919, 23, 119—122.

SODIUM or ammonium thiosulphate in 5% aqueous solution dissolves mercury fulminate rapidly and completely, whilst leaving the impurities which it

commonly contains undissolved. In these solutions the fulminate may be estimated by Heaven's method (this J., 1918, 143 r). These solvents are more satisfactory than 5% aqueous potassium cyanide. For the recovery of mercury from the residues from the manufacture of mercury fulminate the following process is recommended. The residues are extracted at 50° C. with a 15% solution of sodium thiosulphate (using 20 litres per kilo. of residue). The solution is acidified with sulphuric acid and boiled, whereby the whole of the mercury is precipitated in the form of sulphide, which is separated and distilled with lime, metallic mercury passing over.—W. G.

Nitrocellulose; Transformations of — A. Angeli.

Atti R. Accad. Lincei, 1919 [v], 23, I., 20—24.

THE action of pyridine on nitrocellulose yields a white, amorphous substance which contains 9—10% of nitrogen and forms very stable colloidal aqueous solutions. (See J. Chem. Soc., 1919, 1, 196.)

—T. H. P.

PATENTS.

Picric acid; Manufacture of — L. G. Badier and L. B. Holliday, Huddersfield. Eng. Pat. 9902, 8.7.15.

1,2,4-DINITROPHENOL, obtained from commercial 1,2,4-chlorodinitrobenzene, is mixed with 98% sulphuric acid, and a mixture of nitric and sulphuric acids added. The mixture is allowed to stand for about 12 hours and is then added to cold water. The picric acid is filtered off, washed with cold water, centrifuged, and dried.—T. St.

Trinitro compound; Process of producing — from phenol. R. L. Datta and P. S. Varma, Calcutta, India. U.S. Pat. 1,292,266, 21.1.19. Appl., 17.8.16.

A PHENOL is sulphonated, and after removing all traces of unchanged phenol, the product is treated with nitrous gases with the formation of a trinitrophenol, which is then separated.—I. A. C.

Explosive; High — E. I. Pronk and F. E. W. Bowen, London. Eng. Pat. 10,865, 27.7.15.

THE explosive contains as essential constituents ammonium perchlorate and calcium or barium silicide. Other materials are added according to requirements, a suitable mixture consisting of ammonium perchlorate 75, calcium silicide 15, and paraffin wax 10%. Nitro-hydrocarbons may be added to render detonation more rapid, and alkali nitrates may be substituted for a part of the perchlorate to reduce the amount of gaseous chlorine compounds formed.—T. St.

[*Explosive mixtures*]; *Apparatus for solidification or evaporation [of —]*. F. I. Du Pont, Wilmington, Del., Assignor to E. I. du Pont de Nemours and Co. U.S. Pat. 1,284,074, 5.11.18. Appl., 16.9.13.

THE apparatus comprises two concentric conical rotary drums with a thin partition between them. The material under treatment passes along a spiral groove on the outer face of the inner drum and a heating or cooling agent along a corresponding groove on the inner face of the outer drum. Both the heating or cooling agent and the material are discharged at the larger ends of the respective drums.

Smokeless powder; Process for recovering solvent from — F. I. du Pont, Assignor to Delaware Chemical Engineering Co., Wilmington, Del. U.S. Pat. 1,294,066, 11.2.19. Appl., 4.1.17.

THE solvent, e.g. alcohol and ether, is gradually evaporated, and only a portion of the vapours condensed, the remainder of the uncooled vapours being returned to the material.—C. A. M.

Waste acids; Recovery or utilisation of the — left adhering mechanically to pulped nitrocellulose. J. Umbach, Kandern. Ger. Pat. 309,936, 1.3.18.

THE nitrocellulose, after centrifuging or pressing, is agitated with a solution of an alkali, such as ammonia, and the mixed ammonium sulphate and ammonium nitrate so obtained are either used direct as a fertiliser or are separated by fractional crystallisation. Up to 95% of the acid remaining with the nitrocellulose can be thus recovered in the form of salts.—T. St.

XXIII.—ANALYSIS.

Indicators; Colloid chemistry of —. II. Wo. Ostwald. Kolloid-Zeits., 1919, 24, 67—69.

CONGO-REDIN (sodium salt of benzidine-bis-azo- β -naphthol sulphonaphthionic acid) in aqueous solution is a highly disperse system, intermediate between that of a true colloid and a molecular disperse system. It is negatively charged and has a red colour which is changed to blue by the addition of acids, a large number of neutral salts, by alkaline salts such as sodium carbonate, and by bases like barium hydroxide. The blue solutions, on dilution with large volumes of water, elevation of the temperature or addition of alcohol, acetone or pyridine, become red. A further addition of an electrolyte to the blue solution causes a precipitation of the coloured substance, which on washing with water passes into solution as a blue to violet hydrosol. The blue solutions are less highly disperse than the red solutions, and on standing deposit a slight precipitate leaving a red solution. The red solutions contain a still more highly disperse orange coloured fraction.—J. F. S.

Bases and acids; New reagent for —. M. Chauvierre. Bull. Soc. Chim., 1919, 25, 118—119.

A FILTERED aqueous extract of red beetroot is a violet-red, opalescent liquid, which turns deep yellow in the presence of alkalis, and retains its colour in the presence of either mineral or organic acids. It is sensitive to sulphuric acid containing 1 part of acid in 10,000 of water. Test-papers cannot be prepared from it as it does not dye paper.

—W. G.

Tyndallmeter for the examination of disperse systems. R. C. Tolman and E. B. Vliet. J. Amer. Chem. Soc., 1919, 41, 297—300.

AN instrument for measuring the strength of a Tyndall beam in suspensions, colloidal solutions, smoke, and mists is described. It consists of a 6—8-volt lamp, a condensing lens, and a diaphragm through which the beam of light enters the chamber containing the gas or solution. The strength of the beam is then determined by a Macbeth illuminometer which has been standardised with either a suspension of finely divided silica or an opaque glass.—J. F. S.

Ultramicroscopic particles; Method of measuring the size of —. P. V. Wells and R. H. Gerke. J. Amer. Chem. Soc., 1919, 41, 312—329.

THE size of ultramicroscopic particles suspended in air can be measured by bringing the particles (e.g. smoke) into the field of an ultramicroscope which lies in a rapidly alternating electrostatic field and photographing the path of the particles. The diameter is calculated from the amplitude of the oscillation. Smoke particles have diameters varying between 5×10^4 cm. and 10^4 cm. (See also J. Chem. Soc., May, 1919.)—J. F. S.

Arsenious oxide as a standard substance in iodimetry. R. M. Chapin. J. Amer. Chem. Soc., 1919, 41, 351—358.

FROM a series of accurate volumetric experiments it is shown that arsenious oxide is a more reliable substance than iodine as a standard in iodimetry.

—J. F. S.

"Dracorubin" and "dracorubin capillary" tests for identifying and differentiating colourless liquids. K. Dieterich. Ber. Deuts. Pharm. Ges., 1918, 28, 449—492.

"DRACORUBIN" is the name given to the portion of Sumatra palm resin (palm dragon's blood) which is insoluble in boiling light and heavy petroleum spirit. Test-papers are prepared by dipping strips of filter-paper, 7 by 1 cm., in an alcoholic or benzene solution of "dracorubin"; the strips are then dried. The test is carried out as follows:—A stoppered cylinder, 10 cm. high and 3 cm. in diam., is nearly filled with the liquid to be tested and 4 strips of the paper are introduced; the appearance of the liquid is observed during the first 15 mins., the tube is then shaken, set aside for 24 hrs., and the papers removed. Various organic liquids have a different solvent action on the "dracorubin" and the coloration of the liquid and of the papers at the end of the test affords a means of identifying the liquid. For example, light petroleum spirit does not dissolve the substance and remains colourless; if the petroleum spirit contains a trace of benzene or alcohol, a red liquid is obtained. The coloration of the liquid and the appearance of the paper vary with the nature of the liquid under examination; these are described for such liquids as petroleum, benzene, formaldehyde solution, chloroform, turpentine, ether, ethyl acetate, toluene, xylene, carbon bisulphide, acetone, amyl alcohol, etc. In the "capillary" test, the paper is immersed to a depth of only 1 cm. in the liquid.

—W. P. S.

Glucinum in beryl. Copaux. See VII.

Reagent for ozone. Benoit. See VII.

Marking glass. Bock. See VIII.

Glycerol. Grün and Wirth. See XII.

Cupric-sodium hydroxide reagent. Justin-Mueller. See XVII.

Striegler's reagent. Brouwer. See XVII.

Diastatic power. Wilson and Minchin. See XVIII.

Non-protein nitrogen in milk. Denis and Minot. See XIXa.

Lactose in milk. Salomon and Diehl. See XIXa.

Galapiezometer. Le Roy. See XIXa.

Nitrogen distribution in seeds. Brewster and Alsberg. See XIXa.

Feeding stuffs. Eckstein and Grindley. See XIXa.

Alkaloids and adrenaline. Denigès. See XX.

PATENTS.

Testing apparatus [for flue-gases]. F. B. Gilbert, Chicago, Ill. U.S. Pat. 1,282,409, 22.10.18. Appl., 14.8.16.

THE apparatus consists of a vessel provided with a gas inlet and outlet and containing a quantity of alkali solution covered with a layer of mineral oil. The oil prevents the gas under examination from coming in contact with the alkali whilst air is being displaced from the vessel. When the vessel is filled with the gas, it is shaken so as to bring the gas in contact with the alkali, and the diminution of pressure due to absorption of carbon dioxide is read on a pressure-gauge.

Gliding dialysis; Apparatus for carrying out —. H. Thoms, Berlin-Steglitz. Ger. Pat. 309,809, 25.8.17.

THE dialysing membrane is arranged vertically between the two chambers filled with liquid, and carried on a rotating horizontal shaft. The liquids thus rest on the walls of the chambers instead of on the membrane. Considerably larger dialysing surfaces and quantities of liquid can be used without danger of bursting the membrane. (See also this J., 1918, 190 A.)—B. V. S.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Adams. Apparatus for heating and cooling fluids. 9851. Apr. 17.

Aktiebolaget Ljungströms Angturbin. Air-cooled condensers. 9500. Apr. 14. (Sweden, 15.4.18.)

August. Treating liquid and solid bodies for heating, calcining, vaporising, or decomposing them. 9912. Apr. 22.

Ayrton and Sheppard. Cooling or heating means. 9781. Apr. 16.

Belton. Air or gas heating-apparatus. 9598. Apr. 15.

Boyd and Wilson. Continuous-shaft kiln. 10,380. Apr. 26.

Briggs. Apparatus for heating and boiling liquids. 10,144. Apr. 23.

British Thomson-Houston Co. (General Electric Co.). Controlling chemical reactions. 10,150. Apr. 23.

Camell, Cochet, Gritte, and Soc. Lyonnaise des Rechauds Catalytiques Camell, Cochet, Gritte, et Cie. Apparatus for heating by catalysis. 10,075. Apr. 22.

Collins. Furnaces for steam-generators, kilns, etc. 9738. Apr. 16.

Cruyt. Method of utilising heat of waste furnace gases etc. 10,556. Apr. 25.

Handel. Disintegrators. 10,210. Apr. 24.

Harrison. 9639. See II.

Heeley. Distillation furnaces. 10,174. Apr. 23.

Jenkins. Absorption of gases, and its application to vacuum flasks for storing low-temperature liquids. 9642. Apr. 15.

Kilburn (Sulzer Frères). Refrigerating-apparatus. 10,187. Apr. 23.

Laird. Centrifugal machines. 9785. Apr. 17.

Lodge Fume Deposit Co., Lodge, and Lodge. Electrical deposition of particles from gases. 9489. Apr. 14.

McLean. Furnace control. 9878. Apr. 17.

Pease. Subdivision and treatment of fluids. 9467. Apr. 14.

Pedersen. Separating liquid mixtures or emulsions. 10,064. Apr. 22. (Denmark, 20.4.18.)

Priest. Muffle and semi-muffle etc. furnaces. 10,439. Apr. 26.

Rennison. Reversible gas-heated furnaces. 10,307. Apr. 25.

Rouse. Device for transmitting heat from one fluid or vapour to another. 9901. Apr. 17.

Rouse. Air-heating devices. 9902. Apr. 17.

Smith. Furnace retorts. 9768. Apr. 16. 9819. Apr. 17. (U.S., 9.9 and 9.5.18.)

Stokes. Refrigerating-apparatus. 10,037. Apr. 22.

Young and Young. Grinding-machines for vegetable products. 9733. Apr. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

6652 (1916). Nobel's Explosives Co., Lyall, Wilson, O'Connor, and McKillop. Feed control of nitrating, mixing, and similar apparatus. (125,094.) Apr. 24.

6949 (1916.) West. Cooling-apparatus. (125,101.) Apr. 24.

9928 (1916). Chance and Hunt, Holley, and Mott. Apparatus for the treatment of one liquid with another. (125,426.) Apr. 30.

246 (1918). Garbutt, and British Carbonizing Co. Rotary furnaces. (125,484.) Apr. 30.

4493 (1918). Tilstone and Tilstone. See VIII.

6229 (1918). Smallwood. Furnaces. (125,224.) Apr. 24.

6108 (1918). Sturgeon. Centrifugal separators. (125,502.) Apr. 30.

6434 (1918). Pollak (Toronto Type Foundry Co.). Grinding-machines. (125,503.) Apr. 30.

6613 (1918). Alexander. Apparatus or kilns for drying granular, pulverulent, and pasty materials. (125,235.) Apr. 24.

6804 (1918). Smallwood. Furnaces. (125,515.) Apr. 30.

7832 (1918). King, Gregson, and Taudevin Gregson, Ltd. Gas-heated furnaces. (125,258.) Apr. 24.

10,050 (1918). Dunker. Apparatus for treating air or other gases. (125,280.) Apr. 24.

13,557 (1918). Mason. Filter presses. (125,304.) Apr. 24.

21,529 (1918). Draper. Separators for the treatment of coal, clays, ores, and the like. (125,344.) Apr. 24.

1284 (1919). Van Rede. Roller mills. (123,063.) Apr. 24.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

Assereto. Combustion of solid pulverised fuel. 10,175. Apr. 23.

Atkinson, and Powdered Fuel Plant Co. Combustion of powdered fuel. 9893. Apr. 17.

Berglund. 9903. See X.

Bilefeld. Incandescent electric lamps. 10,241. Apr. 24.

British Thomson-Houston Co. (General Electric Co.). Incandescent lamps etc., and manufacture of same. 9865. Apr. 17.

Camell and others. 10,075. *See* I.
Combustion Improvements, Ltd. (Surface Combustion, Inc.). Combustion of explosive gaseous mixtures. 10,323. Apr. 25.

De Ayestaran. Process for effecting agglomeration of coals. 10,237. Apr. 24.

Forwood and Taplay. Treatment of hydrocarbons. 9722. Apr. 16.

Freedman. Electric arc lamps. 9704. Apr. 16.

Grainger and Shadbolt. 9784. *See* VII.

Harrison. Apparatus for washing coal, coke, sand, etc. 9639. Apr. 15.

Hauser. Retort ovens for distillation of fuels and bituminous ores. 9970. Apr. 22. (Spain, 20,418.)

Heeley. 10,174. *See* I.

Olsson. Treatment of peat. 9756. Apr. 16.

Rennison. 10,307. *See* I.

Rock. Extracting hydrocarbons from coal etc. 9686. Apr. 16.

Sedcole. Apparatus for distilling carbonaceous material. 10,447. 10,448. Apr. 26.

Stafford. Process of destructive distillation. 9491. Apr. 14.

Swinburne. Low-temperature distillation. 9987. Apr. 22.

Wiltshire. Gas-producer plants for vehicles, locomotives, aircraft, etc. 10,092. Apr. 22.

COMPLETE SPECIFICATIONS ACCEPTED.

7286 (1916). Maxted and Ridsdale. *See* VII.

9481 (1916). Maxted. *See* VII.

10,479 (1916) and 798 (1917). Roxburgh, Sanderson, and Sanderson. Manufacture of charcoal from wood. (125,439.) Apr. 30.

4203 (1918). Toogood, and Dempster and Sons. Heating of horizontal retorts for gas production. (125,189.) Apr. 24.

5917 (1918). British Thomson-Houston Co. (General Electric Co.). Vacuum electric discharge apparatus for lighting. (125,201.) Apr. 24.

6313 and 8438 (1918). Rew. Carbonisation of coal and similar carbonaceous substances. (125,496.) Apr. 30.

6427 (1918). Tai-Koo Sugar Refining Co. (Obrembski and Resker). Process for the production of decolorising carbon. (125,230.) Apr. 24.

7698 (1918). Soddy. Method of stripping the illuminants from and of purifying coal-gas by means of charcoal. (125,253.) Apr. 24.

7803 (1918). Arkell. Artificial fuels, and processes for manufacturing the same. (125,256.) Apr. 24.

7832 (1918). King and others. *See* I.

8624 (1918). Wise. Distilling oil from coal and the like. (125,528.) Apr. 30.

10,050 (1918). Dunker. *See* I.

21,529 (1918). Draper. *See* I.

III.—TAR AND TAR PRODUCTS.

APPLICATION.

Forwood and Taplay. 9722. *See* II.

COMPLETE SPECIFICATIONS ACCEPTED.

10,885 (1916). Hird. Process for extracting tar acids or phenols from coal or wood tar or coal or wood tar oils in the distillation or vaporisation of same. (125,445.) Apr. 30.

12,014 (1918). Soc. d'Éclairage, Chauffage, et Force Motrice. Production of high-percentage anthracene. (119,855.) Apr. 24.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

Davies. Manufacture of dyes. 10,247. Apr. 24.
MacLaurin. Manufacture of dyes. 10,246. Apr. 24.

COMPLETE SPECIFICATIONS ACCEPTED.

8773 (1916). Baxter. *See* XXII.

11,411 (1916). Ramy. *See* XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

De Cew and Marx. Treatment of paper pulp. 9576. Apr. 15.

Farrell. Textile etc. drying cylinders. 9681. Apr. 16.

COMPLETE SPECIFICATION ACCEPTED.

6587 (1916). Cochrane. Production of fabrics having the property of invisibility. (125,093.) Apr. 24.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Gatty. Dyeing on vegetable fibres, yarns, and fabrics. 9708. Apr. 16.

Lomax. Finishing or lustring textile fabrics. 9532. Apr. 15.

Poulson. Sizing textile fabrics etc. 9656. Apr. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

7547 and 7826 (1918). Robertson. Printing woven fabrics. (125,251 and 125,257.) Apr. 24.

13,381 (1918). Hindle. Printing woven fabrics. (125,302.) Apr. 24.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Ashcroft. Manufacture of anhydrous magnesium chloride and anhydrous calcium chloride. 10,146. Apr. 23.

Ashcroft. Manufacture of oxides or salts of tungsten or metallic tungsten from substances containing tungsten. 10,147. Apr. 23.

Ashcroft. Manufacture of oxides or salts of metals, or of metals, or of non-metals, or of compounds of non-metals from ores, minerals, intermediate products, residues, wastes, etc. 10,148. Apr. 23.

Ashcroft. Manufacture of aluminium or its oxides or salts from materials containing aluminium. 10,149. Apr. 23.

Bloomfield, Boake, Roberts and Co., and Durrans. Method for manufacture of sulphuryl chloride. 9479. Apr. 14.

Boake, Roberts and Co., and Durrans. Method for manufacture of sulphuryl chloride. 9480. 9481. Apr. 14.

Grainger and Shadbolt. Manufacture of ammonium sulphate. 9784. Apr. 16.

Marks (Armour Fertilizer Works). Production of aluminium nitride etc. by electrically-generated heat. 9492. Apr. 14.

Mellersh-Jackson (Air Reduction Co.). Manufacturing cyanides. 10,188. Apr. 23.

Morel. Production of basic sulphate of chrome and its application to tanning etc. 10,074. Apr. 22.

Tyrer. Treatment of aluminiferous materials to obtain alumina etc. 9621. Apr. 15.

COMPLETE SPECIFICATIONS ACCEPTED.

7286 (1916). Maxted and Ridsdale. Manufacture of hydrogen. (125,112.) Apr. 24.

9481 (1916). Maxted. Manufacture of hydrogen. (125,410.) Apr. 30.

10,852 (1916). Cocking, and Kynoch, Ltd. Manufacture of nitric acid and ammonium sulphate. (125,444.) Apr. 30.

11,036 (1916). Bensa. Process for the production of alkaline nitrates by oxidation of ammonia. (125,453.) Apr. 30.

14,614 (1918). Gill (Fansteel Products Co.). See X.

14,756 (1918). Dawson. Process for the production of sodammonium sulphate from nitre-cake or other acid sodium sulphates. (125,311.) Apr. 24.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Hughes. Apparatus for annealing glass. 9960. Apr. 22.

Marks (Fours et Procédés Mathy Soc. Anon.). Glass ovens or furnaces. 9496. Apr. 14.

Sharp (Willmer). Pots or crucibles for melting glass or metals. 10,145. Apr. 23.

COMPLETE SPECIFICATIONS ACCEPTED.

4493 (1918). Tilstone and Tilstone. Fuel-economiser or heat-regulator for ovens and kilns for firing pottery and the like. (125,486.) Apr. 30.

21,529 (1918). Draper. See I.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Andouard. 9911. See XIII.

Bell's United Asbestos Co., Cann, and Hurden. Manufacture of slabs or blocks for buildings etc. 9578. Apr. 15.

Dale. Concrete. 9678. Apr. 16.

COMPLETE SPECIFICATION ACCEPTED.

6248 (1918). Kelsey. Waterproof compound or preparation for roofing and other purposes. (125,492.) Apr. 24.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Ashcroft. 10,147. 10,148. 10,149. See VII.

Berglund. Apparatus for sintering concentrates, distilling slate, etc. 9903. Apr. 17.

Berry. Copper alloy. 10,358. Apr. 25. (U.S., 13,818.)

Bowen and Marino. Electrolytic process for coating iron or steel with lead or antimony or alloy of lead and antimony. 10,314. Apr. 25.

Comp. d'Applications Mécaniques. Steel for manufacture of ball and roller bearings etc. 10,141. Apr. 23. (France, 2,518.)

Cunningham, and Stein and Atkinson. Furnaces for heat treatment of metals. 10,132. Apr. 23.

Evans, Marquis, and Schader. Process of extracting copper from ores and refining crude copper. 10,037. Apr. 22.

Hauser. 9970. See II.

Jackson. Production of iron. 10,333. Apr. 25.

Le Chatelier. 9483. See XI.

Mumford, and Mumford, Ltd. Alloy, and method of making and using same. 9460. Apr. 14.

Norsk Hydro-Elektrisk Kvaestofaktieselskab. Metallurgical processes. 10,131. Apr. 23. (Norway, 15,518.)

Park. Machine for separating minerals from ore-bearing materials. 9510. Apr. 14.

Sharp (Willmer). 10,145. See VIII.

Speer. Chrome nickel steel. 10,338. Apr. 25.

COMPLETE SPECIFICATIONS ACCEPTED.

7562 (1916). Annable, and Nickel Concentration, Ltd. Extraction of nickel from silicate ores. (125,119.) Apr. 24.

8655 (1916). Hadfield. Manufacture of manganese steel. (125,157.) Apr. 24.

8825 (1918). Alexander, Vint, and Imbery. Means for and method of hardening and tempering steel or other metal wire. (125,180.) Apr. 24.

5117 (1918). Frankignoul. Blast furnaces. (125,194.) Apr. 24.

11,148 (1918). Mooney. Treating steel for aircraft. (125,544.) Apr. 30.

11,553 (1918). Cliff. Puddling, reheating and similar metallurgical furnaces. (125,546.) Apr. 30.

14,614 (1918). Gill (Fansteel Products Co.). Treatment and circulation of hydrogen in connection with the reduction of tungsten trioxide. (125,310.) Apr. 24.

21,529 (1918). Draper. See I.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Bowen and Marino. 10,314. See X.

Campbell, Gifford, Taylor, Waite, and Campbell, Gifford and Waite. Control of power absorbed in electric furnace. 10,357. Apr. 25.

Dekker. Process of electrolysis. 10,155. Apr. 23.

Ivey and Salisbury. Battery cells. 10,066. Apr. 22.

Le Chatelier. Electrodes for electric welding. 9483. Apr. 14.

Lodge Fume Deposit Co., and others. 9489. See I.

Marks (Armour Fertilizer Works). 9492. See VII.

Marks (Armour Fertilizer Works). Polyphase electric heating-furnaces. 10,053. Apr. 22.

Marsh. Electrolytic cells. 10,116. Apr. 23.

Oldham and Oldham. Galvanic batteries. 10,268. Apr. 24.

Roberts. Electric batteries. 9583. Apr. 15.

Teixeira. Electric furnaces. 9924. Apr. 22.

Withers (National Electro-Products, Ltd.). Apparatus for electrolysing liquids. 10,179. Apr. 23.

COMPLETE SPECIFICATIONS ACCEPTED.

3726 (1918). Bibby. Electric furnaces. (125,179.) Apr. 24.

6256 (1918). Brush Electrical Engineering Co., and Sutton. Electric resistances. (125,225.) Apr. 24.

6875 (1918). Wielgolaski. Electric arc furnaces. (125,516.) Apr. 30.
 7727 (1918). Armelin. Electric dry batteries. (125,254.) Apr. 24.
 7957 (1918). Gow and Campbell. Control of power absorbed in electric furnaces. (125,522.) Apr. 30.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Cooper. Apparatus for treating bones etc. for recovery of fats, oils, etc. 9437. Apr. 14.
 Dave. Manufacture of castor oil. 9843. Apr. 17.
 Force. Detergent compound. 10,094. Apr. 22. (U.S., 19.4.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

6170 (1918). Feldenheimer and Plowman. Saponaceous compositions, and the process of manufacturing the same. (125,491.) Apr. 30.
 18,032 (1918). Schuck, and Superior Oil and Process Co. Process of separating liquid fats or oils from solid fatty materials. (125,327.) Apr. 24.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Andouard. Production of coatings for paint or cement etc. 9911. Apr. 17. (France, 27.11.13.)
 Boake, and Boake, Roberts, and Co. Preparation and manufacture of dopes, varnishes, etc. 9751. Apr. 16.
 Jones. Violin varnish. 9435. Apr. 14.
 Lillie. Paints and antifouling etc. substances. 9433. Apr. 14.
 Marter and Raw. 10,121. See XIV.

COMPLETE SPECIFICATION ACCEPTED.

309 (1919). Kohler. Process of producing colophony of high quality from old natural resin of conifers. (122,407.) Apr. 24.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATION.

Marter and Raw. Non-inflammable and plastic composition. 10,121. Apr. 23.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATIONS.

Couch. Manufacture of patent leather etc. 9782. Apr. 16.
 Hefford and Hefford. Leather. 10,417. Apr. 26.
 Morel. 10,074. See VII.

XVI.—SOILS; FERTILISERS.

COMPLETE SPECIFICATION ACCEPTED.

14,756 (1918). Dawson. See VII.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

Baker and Sons, Bradley, Carr, Peek, Frean, and Co., and Rowntree and Co. Treatment of sugar. 9826. Apr. 17.
 O'Gorman and Schryver. Manufacture of adhesives. 9874. 9875. Apr. 17.

COMPLETE SPECIFICATIONS ACCEPTED.

6427 (1918). Tai-Koo Sugar Refining Co. (Obrembski and Resker). See II.
 18,668 (1918). Barker. See XIX.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Franks. Process of preserving organic substances. 10,315. Apr. 25.
 Kershaw. Refuse-destructors etc., and production and treatment of a fluid slag therefrom. 9854. Apr. 17.
 Lillie. 9433. See XIII.
 Naaml. Vennoots. A. Jurgens' Vereenigde Fabrieken. Manufacture of artificial milk products. 10,176. Apr. 23. (Holland, 18.6.18.)
 Thomson. Process for reduction of animal flesh in preparation of foods and medicinal animal extracts. 9610. Apr. 15.

COMPLETE SPECIFICATIONS ACCEPTED.

11,263 (1917). Stevens and Baumann. Milk food products and methods of making the same. (125,172.) Apr. 24.
 18,668 (1918). Barker. Production of pectous substances. (125,330.) Apr. 30.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Loo. Manufacture of organic compounds and their condensation products. 9537. Apr. 15.
 Marks (New Jersey Testing Laboratories). Alcohols etc. and process of making same. 10,050. Apr. 22.
 Thomson. 9610. See XIX.

COMPLETE SPECIFICATIONS ACCEPTED.

8635 (1916). Cross and Dreyfus. Processes of hydrolysis or saponification of esters. (125,153.) Apr. 24.
 483 (1918). Zollinger. Process for the production of polyoxy fatty acid esters. (112,624.) Apr. 24.
 7119 (1918). Blanc. Manufacture of aromatic aldehydes. (115,244.) Apr. 24.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

COMPLETE SPECIFICATION ACCEPTED.

5810 (1918). Burnett. Negative plate substitutes for radio-photography. (125,490.) Apr. 30.

XXII.—EXPLOSIVES; MATCHES.

COMPLETE SPECIFICATIONS ACCEPTED.

6523 (1916). Baxter. Manufacture of nitroglycerine. (125,091.) Apr. 24.
 6652 (1916). Nobel's Explosives Co., and others. See I.
 7203 (1916). Dreyfus. Process for the purification of trinitrotoluene and such like bodies. (125,110.) Apr. 24.
 7857 (1916). Johnson. Manufacture of explosives. (125,128.) Apr. 24.
 8234 (1916). Chance and Hunt, Holley, and Mott. Process for the washing of trinitrotoluene and other nitro compounds. (125,140.) Apr. 24.
 8773 (1916). Baxter. Manufacture of picric acid and other products of nitration. (125,160.) Apr. 24.
 11,411 (1916). Ramy. Process for manufacturing picric acid. (125,461.) Apr. 30.
 8623 (1917). Du Pont de Nemours and Co. Propellant explosives. (125,482.) Apr. 30.

I.—GENERAL; PLANT; MACHINERY.

Selenium and its applications. Ancl. See VII.

PATENTS.

Drying sand and similar granular material; Apparatus for —. G. F. W. Hope, Leigh-on-Sea. Eng. Pat. 124,244, 20.2.18. (Appl. 3054/18.)

THE material is delivered from a hopper on to perforated shelves hinged to the wall of a horizontal rotating drum. As the drum is rotated the hinged shelves drop to the side and any lumps formed are broken by beaters attached to the shaft of the drum. The outer ends of the beaters rest on angle-pieces attached to the shell of the drum, so that they are raised as the drum rotates until their outer ends slip off the angles and they fall back and crush any lumps they meet. The partly dried material is delivered from the lower part of the drum on to a series of heated vibrating drying plates.—W. H. C.

Dryer. A. F. Sinclair, New York. U.S. Pat. 1,204,547, 18.2.19. Appl., 16.9.16.

A ROTARY drying cylinder is connected at one end with a furnace, and at the opposite end with a chimney. The furnace flame is prevented from entering the cylinder by means of a series of spaced screens of graded mesh, the screen nearest the furnace being the coarsest and that farthest from the furnace the finest.—S. S. A.

Crushing and drying machine. J. G. Hopper, Paris. Eng. Pat. 120,931, 22.11.18. (Appl. 19,253/18.) Int. Conv., 25.7.17.

TWO metal discs, slightly concave, are arranged with their concave sides facing one another in a horizontal plane and are mounted on vertical shafts so as to rotate in opposite directions, or at different speeds in the same direction. The material is fed from a hopper through the hollow shaft of the upper disc into the space between the discs, the opposing faces of which are grooved or fluted to crush the material. The crushed material leaves the annular opening at the edges of the discs and is thrown by centrifugal force against a concentric cylindrical strainer which is vibrated rapidly. Any water separated from the material passes through the strainer, whilst the solid material falls into an annular receiver at the bottom of the strainer.

—W. F. F.

Grinding mills. E. Newell and Co., Ltd., and G. L. Woodhouse, Misterton. Eng. Pat. 124,930, 25.4.18. (Appl. 6960/18.)

A HORIZONTAL ball mill is divided into two compartments by a transverse partition. The material to be ground is fed through the hollow trunnion into the first compartment and after being ground passes through perforations in the circumferential stepped grinding plates to a cylindrical sieve plate which surrounds the grinding plates. The finer particles pass through the sieve into an annular space between the sieve plate and the outer shell, and the coarser particles are returned between the stepped grinding plates to be re-ground. The fine particles in the annular space are carried forward by helical conveyor ploughs and discharged through an aperture in the transverse partition into the second compartment, where the grinding is completed.

—W. H. C.

Comminuting mill. R. C. Newhouse, Wanwatsa, Wis., U.S.A. Eng. Pat. 125,012, 30.9.18. (Appl. 15,856/18.)

A HORIZONTAL ball mill rotated on hollow trunnions is divided into two compartments by an adjustable transverse partition. The material to be ground is fed through the hollow trunnion at one end into the first compartment and is ground by the action of the balls. The finer portions pass through an adjustable annular screen, formed of horizontal bars, supported near the partition, are lifted by a spiral elevator blade in the space between the screen and the shell, and are discharged into the second chamber where final grinding takes place. When ground sufficiently, the particles pass through a second transverse screen at the far end of the cylinder and are discharged through the other hollow trunnion.—W. H. C.

Pulverising and separating machine. W. H. Berry, Chester, Pa. U.S. Pat. 1,292,686, 28.1.19. Appl., 11.10.17.

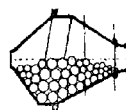
THE material is charged into a receptacle one side of which is formed of adjustable bars. The material is disintegrated by knives or teeth which project through the spaces between the bars and are reciprocated at varying angles and speeds by external mechanism. The pulverised material is ejected through the spaces between the bars, whilst the unpulverised portion is carried to the ends of the receptacle.—W. H. C.

Grinding-mill. J. K. Griffith, Assignor to A. J. Griffith, Pittston, Pa. U.S. Pat. 1,295,482, 25.2.19. Appl., 18.4.16.

IN a tube-mill having internal circumferential corrugations, the grinding elements consist of bodies shaped like dumb-bells. The elements are so shaped that the ends co-act with the neck portions of adjacent grinding bodies.—W. H. C.

Grinding-mill. J. W. Garrow, Assignor to J. D. Cumming and G. R. Craig, Copper Cliff, Ont. U.S. Pat. 1,295,720, 25.2.19. Appl., 17.5.17.

A GRINDING-DRUM (see fig.), which rotates about a horizontal axis, has a short cylindrical section at the middle, the planes of the ends of this section



being inclined to the axis of the drum; from the cylindrical section the walls taper to the inlet and discharge openings.—W. E. F. P

Humidifying or filtering air or other gases; Apparatus for —. L. Dunker, Rugby. Eng. Pat. 124,287, 22.3.18. (Appl. 5085/18.)

THE filter described in Eng. Pat. 112,653 (this J., 1918, 114 A) is built up of plates of standard size so that its capacity may be increased by adding more plates.—W. H. C.

Air cleaner and process for cleaning air. O. Kutsche, Pittsburgh, Pa. U.S. Pat. 1,274,058, 30.7.18. Appl., 1.3.17.

THE conduit carrying the stream of warm, dust-laden air has a number of apertures through which cold clean air is introduced, to separate the dust.

laden air from the walls of the conduit, whereby the formation of charged particles is avoided and coalescence is induced. The air then enters tangentially the bottom of a vertical cylindrical vessel containing rotating vanes which impart a whirling motion to it, whereby particles of agglomerated, coalesced dust are separated. Leaving the top of this vessel in a tangential direction the air passes into a smaller vessel in which it is again given a whirling motion by vanes more steeply pitched than those in the first vessel; the dust which separates is collected on the conical bottom of the vessel and is removed through a pipe at the bottom.—J. H. P.

Boiler furnaces or the like; Drying fuel supplied to —. W. R. Wood, London. Eng. Pat. 124,314, 22.4.18. (Appl. 6779/18.)

COAL is fed to a boiler furnace through an inclined shoot which passes through the waste gas flue so as to dry the fuel. The portion of the shoot within the flue is constructed of bars forming louvres so that the hot gases may pass transversely through the shoot, which is maintained full of coal. The flue is provided with a baffle which compels the hot gases to pass twice through the column of fuel, and dampers are provided in the wall separating the combustion chamber from the waste gas flue above and below the baffle, so that any desired proportion of the hot gas may pass directly to the flue without passing through the column of fuel. The fuel is finally discharged on to a mechanical stoker.

—W. F. F.

Furnaces; Means for preventing or consuming smoke in —. J. W. Huelin, London. Eng. Pat. 124,603, 11.4.18. (Appl. 6202/18.)

A FURNACE for a boiler or the like is provided with a plate extending rearwards from the furnace front below the firebars, and with a flap valve in the "dead plate" in front of the firebars. Air may thus pass from the ashpit between the plate and the firebars, and then upwards, partly through the fire, and partly through the flap valve to the combustion space. The valve is connected to a liquid dashpot device, which is set so that the valve is fully open just after the furnace is supplied with fresh fuel, and preheated air is therefore supplied to burn the gases and smoke which are given off by the fuel. The dashpot is provided with a needle valve so as to permit the liquid to pass from one side of its piston to the other in a predetermined time, the flap valve reaching its closed position when the fire becomes incandescent. An open-work brick baffle is also provided at the back of the combustion chamber to intercept solid particles which may pass over the furnace bridge. The flat plate below the firebars may be formed in one or more sections which may be pivoted so as to be tilted to discharge ashes.—W. F. F.

Crystallisation of substances [e.g., phenacetin] in solution; Method of and means for effecting rapid —. O. Reynard, Bradford. Eng. Pat. 124,324, 11.5.18. (Appl. 7959/18.)

THE solution is passed through a succession of dished metal trays, preferably made of aluminium, each having a false bottom and hollow sides through which a cooling medium is circulated. The solution, together with the deposited crystals, is then passed through a filter. The application of the process to the production of white crystals of phenacetin is claimed.—W. H. C.

Non-conducting coating for insulating pipes and other vessels or articles in chemical works. H. Lonsdale, Blackburn. Eng. Pat. 124,597, 6.4.18. (Appl. 5919/18.)

TO provide an insulating covering that will withstand the injurious effects of ammonium nitrate, 18, b.

the pipe or other vessel is covered with five coats of material. The first coat consists of 20% sodium silicate, 20% kieselguhr, and 60% white asbestos fibre; the second of 20% sodium silicate, 25% kieselguhr, and 55% white asbestos fibre; the third of equal parts of kieselguhr, blue asbestos fibre, and sodium silicate, and the fourth of 50% blue asbestos fibre, 10% white asbestos fibre, 20% sand, and 20% sodium silicate. After application of the fourth coat the surface is painted with hydrochloric acid of 20° Tw. (sp. gr. 1.1) and the fifth or final coat consisting of 50% sodium silicate, 25% quartz, and 25% white asbestos fibre is applied.—W. H. C.

Super-imposing films of material to be dried on a pair of heated cylinders; Method of — the same being also applicable for evaporating moisture from solids. J. McIntyre, Portobello, and J. Milne and Son, Ltd., Edinburgh. Eng. Pat. 124,668, 2.9.18. (Appl. 14,230/18.)

THE materials are applied to the exterior surface of the internally heated cylinders at three or more different parts of the periphery by distributing rolls, so that as the cylinders rotate additional layers of fresh material are deposited on those already partly dried.—W. H. C.

Mixing concrete and similar material; Machines for —. C. C. Trew and E. le Bas, London. Eng. Pat. 124,961, 7.6.18. (Appl. 9406/18.)

THE material is fed from a hopper into one end of a horizontal drum through an opening provided with a shutter, and discharged through an opening at the other end which is provided with a pivoted shoot. Mixing blades, U-shape in cross-section, are provided at one or both ends of the drum to throw the material towards the other end or the centre of the drum, and lifting blades are provided to receive the material and complete the mixing.—W. F. F.

Spraying or atomising liquids or fluids and heating, cooling, or mixing the same. J. W. Stevenson, Ebbw Vale. Eng. Pat. 120,078, 22.10.17. (Appl. 15,340/17.)

THE apparatus comprises a drum of relatively small height, arranged vertically, with one or more tangential inlets for the liquid to be atomised at the periphery and an axial outlet. The inlet extends practically over the entire height of the drum, and the outlet has a sectional area equal to or greater than that of the inlet. In order to enhance the circular movement of the fluid, a cone may be provided on the end of the drum opposite the outlet, but not extending into or through the outlet; the interior surface of the drum may have a spiral formation. In a modification, two axial outlets are provided, in opposite ends of the drum. For cooling, heating, or mixing purposes a second fluid may be introduced through holes or ports in the periphery of the drum.—J. H. P.

Cooling apparatus with automatically controlled supply of cooling fluid. C. Mortensen, Christiania, Norway. Eng. Pat. 124,971, 13.6.18. (Appl. 9763/18.)

A CLOSED chamber containing an easily expansible medium is placed within the cooling or condensing conduit which is itself surrounded by the cooling fluid. The variation of pressure due to the expansion and contraction of the medium acts on a diaphragm which operates the valve controlling the supply of cooling fluid.—W. H. C.

Cooling and drying air; Art of —. W. J. Baldwin, Brooklyn, N.Y. U.S. Pat. 1,292,562, 28.1.19. Appl. 26.9.17.

A CURRENT of air is drawn through a suitable cooling material by a fan. By the centrifugal action of the fan the condensed moisture is separated from the cooled air which is then discharged.—W. H. C.

Filter press plate for filtering acid and other liquid material. W. Furness, Huddersfield. Eng. Pat. 124,974. (Appls. 9921, 17.6.18, and 20,917, 16.12.18.)

A FRAME provided with tightening bolts extending through the top and bottom bars of the frame encloses filter panels of earthenware or other acid-resisting material. The panels have vertically grooved surfaces, the lower ends of the grooves communicating with discharge channels in the frame. Those parts of the frame that are exposed to the action of the acid are protected by a leaden or other suitable covering.—W. H. C.

Filtering-press. J. P. McGlaughlin, Chicago, Ill. U.S. Pat. 1,292,342, 21.1.19. Appl., 5.5.17.

SUPERPOSED horizontal filter leaves or shelves are arranged in two vertical series spaced apart within a cylindrical casing. The shelves are mounted on horizontal pipes so that they can be tilted, and are connected with a common discharge main for the filtrate, and a space is left between the two vertical series of shelves. The mixture to be filtered is introduced into the casing, the liquid passes into the filter leaves and is discharged, the solids being deposited on their outer surfaces. After a time the supply of material is stopped, the bottom of the casing is opened, and the deposited solids are discharged by tilting the leaves or shelves.

—W. H. C.

Filtering-machine; Centrifugal —. A. Kendrick, Newton, Mass., Assignor to International Instrument Co., Cambridge, Mass. U.S. Pat. 1,293,114, 4.2.19. Appl., 3.2.15.

A ROTATING receptacle containing the liquid to be filtered carries a series of hollow filter elements projecting inwards from the periphery and each having an outlet for the filtered liquid extending through the periphery.—W. F. F.

Filter; Upright multistage —. H. A. Hills, Grand Rapids, Mich. U.S. Pat. 1,294,463, 18.2.19. Appl., 7.5.17.

A NUMBER of superposed filter tanks are mounted in an upright frame so that they are movable vertically, and are provided with independent detachable inlet and outlet pipes so that the material to be filtered may be caused to flow upwards through them in succession. Means are provided for heating the contents of the tanks during filtration. The inlet and outlet pipes are valved and so arranged that any tank may be cut out of the series without interrupting the operation of the others.—J. H. P.

Transporting hydrochloric acid or other corrosive liquids by rail, road, or water; Tank for —. British Dyes Ltd., J. Turner, and J. H. West, Huddersfield. Eng. Pat. 124,997, 18.7.18. (Appl. 11,781/18.)

THE tank is built up of sections of steel plate lined with ebonite or vulcanite, vulcanised on to the metal. The sections are connected together by rings of angle iron similarly protected, the joints being made with soft rubber. Baffle-plates of steel protected with ebonite and an ebonite discharge pipe are provided together with a protected man-hole and cover, and air inlet and escape openings. The air-escape opening is provided with baffles to prevent acid escaping with the air.—W. H. C.

Waste gases; Apparatus for washing — and utilising the heat thereof. F. Sargent and H. C. Heaton, Chicago, Ill., Assignors to Babcock and Wilcox Co., Bayonne, N.J. U.S. Pat. 1,291,175, 14.1.19. Appl., 10.7.17.

WASTE gases from a boiler furnace are delivered from the economiser to a chamber in which they

encounter a spray of water or other liquid. The wash-liquid is afterwards used for moistening the air for combustion on its passage to the furnace.

—E. W. L.

Separating foreign materials from gases; Apparatus for —. W. J. Baldwin, Brooklyn, N.Y. U.S. Pat. 1,292,561, 28.1.19. Appl., 18.5.17.

THE gas is passed longitudinally through a horizontal perforated cylinder which is rotated within another fixed cylinder having smaller perforations and surrounded by an outer casing.—W. H. C.

Tunnel-kiln. G. H. Benjamin, New York. U.S. Pat. 1,292,568, 28.1.19. Appl., 8.1.18.

THE combustion chambers are arranged external to the treating chamber and are supplied with heated air from a series of pairs of reversible regenerative preheaters.—W. H. C.

Muffle-furnace. C. T. Torsell, Warren, Ohio. U.S. Pat. 1,295,637, 25.2.19. Appl., 4.6.14.

IN a muffle furnace having a pier extending longitudinally through it the muffle chamber is built of two parallel layers of tongued and grooved bricks or tiles with recesses therein so as to form a closed insulating air space entirely surrounding the chamber.—L. L. L.

Retorts; Method of and apparatus for reinforcing —. F. W. Wood, Baltimore, Md. U.S. Pat. 1,294,743, 18.2.19. Appl., 12.7.15. Renewed 27.7.18.

A RETORT subjected to internal pressure is surrounded by a combustion chamber, and heating gas is introduced into the combustion chamber at a pressure sufficient to reinforce the retort against rupture from internal pressure. The combustion chamber has a flue for the discharge of products of combustion and a valve in the flue is connected with a piston working in a cylinder which communicates with the retort. Increase of pressure in the retort is transmitted to the cylinder and operates to close the valve and prevent egress of gases from the combustion chamber; the pressure in the latter is thus controlled by the pressure in the retort.—J. H. P.

Fire-extinguishing solution having a low freezing point. G. E. Ferguson, New York, Assignor to Pyrene Manufacturing Co. U.S. Pats. (A) 1,292,743 and (B) 1,292,744, 28.1.19. Appl. (A) 20.10.14, (B) 31.5.18.

A SOLUTION having a low freezing point and fire-extinguishing properties consists of (A) aniline or (B) ethyl benzoate, dissolved in carbon tetrachloride.—J. H. J.

Boiler compounds; Method of making —. F. R. Williams, Sharnburg, Pa. U.S. Pat. 1,294,738, 18.2.19. Appl., 29.12.17.

FUSED caustic soda is mixed with tannin or with tannin and graphite.—J. H. P.

Centrifugal process and device. K. B. Howell, East Orange, N.J., Assignor to The Barrett Co. U.S. Pat. 1,294,909, 18.2.19. Appl., 1.11.17.

A NUMBER of superposed discs, spaced apart, are rotated by a vertical shaft attached to the lowest disc. Each of the discs except the lowest one has a central circular aperture, the diameter of the apertures decreasing downwards from disc to

disc. A cylindrical stream of molten material having a greater diameter than the opening in the uppermost disc is fed centrally on to the latter. Part is caught by the rotating disc and is projected outwards into a cooling medium and part passes through the aperture to the next disc, where another portion is caught and thrown outwards and so on to the bottom, where all that remains is projected outwards. An "anti-sticking" material is fed on to the outer edge of each of the discs.—W. H. C.

Oil and other liquid separator and cleaner. J. H. Packer, Liberty, Mo., U.S.A. Eng. Pat. 124,204, 19.3.18. (Appl. 4851/18.)

Recovering waste oils or separating oil from water or other impurities; Apparatus for —. H. C. Longsdon, Keighley. Eng. Pat. 124,551, 22.3.18. (Appl. 5051/18.)

Wood vats or tanks. H. and J. E. Buckley, Manchester. Eng. Pat. 124,956, 4.6.18. (Appl. 9156/18.)

Low-temperature expansion [of gases]; Engine for —. E. A. W. Jefferies, Assignor to Jefferies-Norton Corporation, Worcester, Mass. Reissue 14,597, 25.2.19. of U.S. Pat. 1,264,871, 30.4.18. Appl., 16.11.18.

SEE this J., 1918, 400 A.

Liquid sprayer or atomiser. T. Andrew, Heaton Moor. U.S. Pat. 1,294,373, 18.2.19. Appl., 24.7.17. SEE Eng. Pat. 105,687 of 1916; this J., 1917, 585.

Separating dust or like matter from air or gases and collecting same; Apparatus for —. G. Dod, Southport. U.S. Pat. 1,295,711, 25.2.19. Appl., 17.6.16.

SEE Eng. Pat. 8920 of 1915; this J., 1916, 821.

Kilns. Eng. Pat. 124,909. See VIII.

Kilns. Eng. Pat. 115,232. See IX.

Dryers. U.S. Pats. 1,294,804—5. See XIXa.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Sulphur of coal. The inorganic and organic sulphur of coal and its transformations during the manufacture of coke. Experiments on the quantitative determination of pyrites in coal. J. P. Wibaut and A. Stoffel. Rec. Trav. Chim. Pays-Bas, 1919, 38, 132—158.

For their estimations the authors separated the coal into two fractions by shaking the finely powdered sample with a mixture of benzene and carbon tetrachloride (sp. gr. 1.3) and then leaving it to settle. The light fraction, which floated, had a very low ash content, whilst the heavy fraction had a high ash content. On the original coal and on each fraction the following estimations were made: (1) ash, by ignition of 2 grms.; (2) volatile matter, Muck's method (this J., 1886, 521); (3) total sulphur, Eschka's method, heating 1 gm. of coal with a mixture of magnesias and sodium carbonate; (4) sulphur as sulphates; (5) iron in the form of pyrites; (6) inorganic sulphur. For (4) and (5) 10 grms. of coal was boiled for $\frac{1}{2}$ hour with 200 c.c. of 10% hydrochloric acid and then digested for 24 hours on a water bath. The residue was filtered off, washed, dried, and weighed, and the sulphur present in the filtrate as sulphate was estimated.

The residue was calcined in a platinum crucible and the ash extracted with hot concentrated hydrochloric acid. The iron, which was estimated in the extract, was considered as that present in the form of pyrites in the original coal. For the estimation of inorganic sulphur 1 gm. of the finely powdered coal was mixed with 100 c.c. of water, 1 c.c. of bromine was added, and the mixture heated on the water bath for $\frac{1}{2}$ hour, filtered, the residue well washed, and in the filtrate and washings the sulphate was estimated. This method, while only approximate, was found to give satisfactory results providing that the pyrites content of the coal did not exceed 5%. The organic sulphur content of the coal is given with a fair degree of accuracy by the difference between the result obtained in estimation (3) and the sum of the results obtained in estimations (4) and (6). Anomalous results were obtained in the case of a Scotch cannel coal, which was found to contain sulphur compounds soluble at the ordinary temperature in the mixture of benzene and carbon tetrachloride and also to contain some free sulphur. From an examination of samples of coal and of the coke formed from them it is considered probable that a portion of the sulphur originally combined with iron combines with carbon during the coking process. The sulphur present in coke is mostly in an organic form, coke containing relatively more organic sulphur than the coal from which it is derived. Results obtained with one kind of coal, in which the inorganic sulphur was almost all present as pyrites, indicate that during coking the pyrites decomposes according to the equation, $\text{FeS}_2 = \text{FeS} + \text{S}$.—W. G.

Sulphur; Behaviour of — towards carbonaceous matter at high temperatures. J. P. Wibaut. Rec. Trav. Chim. Pays-Bas, 1919, 38, 159—162. (See preceding abstract.)

WHEN sugar, or the carbon obtained by charring sugar, or wood charcoal is mixed with sulphur and the mixture heated in a closed crucible to bright redness, in each case a product is obtained which, after extraction first with carbon bisulphide and then with ether, contains sulphur to the extent of from 3—6%. Whether this sulphur is chemically combined or only absorbed is not decided.—W. G.

Vertical [gas] retort steaming tests at Springfield, U.S.A. L. J. Willien. New England Assoc. Gas Engineers. Gas J., 1919, 146, 97—98.

THE usual practice with Dessau vertical retorts is to steam the charge during the last two hours of carbonisation only. The yield of gas is thereby increased about 20%, the candle power of the gas reduced 25%, and the calorific power reduced 8%. The steaming of the charge in a Glover-West system of retorts is continuous. The author records results obtained by steaming a system of 24 such retorts. 350 lb. of steam at a superheat of 200° F. (111° C.) was used per retort per day, the supply pressure being maintained at 20 lb. per sq. inch. The yield of gas was increased about 20% by steaming. There was no diminution in the amount of coke. The gas suffered a decrease of 3—4% in calorific value, and a decrease of about 25% in candle power. With steaming, the gas contains about 3% more carbon monoxide and 0.5% more hydrocarbons with less benzene. The hydrogen content is, if anything, slightly reduced. The amount of carbon on the sides of the retort is reduced between 40% and 50%, and moreover is more readily removed. The yield of ammonia is increased about 12%. The liability to the occurrence of stoppages in stand-pipes is reduced by steaming. (Compare this J., 1919, 99 A.)

—J. S. G. T.

Gas from wood and peat; Manufacture of —. E. Ott. Swiss Gas Association. Gas J., 1919, 146, 83–84.

Owing to their comparatively high oxygen content and low carbon content, wood and peat, when subjected to destructive distillation, yield gas containing a high proportion of carbon dioxide, and consequently of low calorific value. The carbon dioxide content of the gas may be reduced by passage of the gas through dry lime. The plan of enriching the crude gas by addition of $\frac{1}{10}$ th of its volume of acetylene is also practicable, and a combination of both methods, entailing enrichment of the gas with acetylene and removal of some of the carbon dioxide by the lime produced from the carbide, is suggested. When using wood the best results are obtained by high temperature distillation in retorts charged to not more than half their capacity; the acetic acid evolved is then decomposed by the incandescent carbon. The difficulties introduced by the acid nature of the condensation products from wood may be reduced by neutralising them with ammonia in the hydraulic main, or by distilling peat or coal along with the wood. The tars yielded by wood and peat are very hygroscopic. The solid residue from wood distillation contains from 2 to 6%, and that from peat from 6 to 50%, of ash. Both solid residues absorb about 30% of water and hence should not be quenched with water.

—J. S. G. T.

Tar fog [from gas]; Electrical precipitation of —. J. G. Davidson. Trans. Canadian Min. Inst., 1918, 21, 252–258.

From experiments made on the crude gases obtained in the distillation of coal, wood, and petroleum by the usual industrial methods, it is concluded that the Cottrell process for removing tar fog is efficient at the highest gas temperatures obtaining in the industries concerned, whereas ordinary methods of removal require a preliminary lowering of the gas temperature. In the case of coal and wood gases, a more complete removal of tar fog was obtained by the electrical method than by the use of ordinary tar extractors, and the aqueous distillates subsequently condensed were much cleaner. The feasibility of electrically precipitating the products of distillation fractionally, at successively lower temperatures, and of recovering ammonia direct from hot coal-gas after electrical precipitation of the tar was also demonstrated. The treater chamber employed in the experiments consisted of a pipe, 15 ft. long and 12 in. in diameter, provided with special insulators of fused quartz; the capacity was about a million cub. ft. of gas per day, for which the total consumption of electricity was equivalent to 2 or 3 H.P.—W. E. F. P.

Ethylene. W. Malisoff and G. Egloff. J. Phys. Chem., 1919, 23, 65–138.

A résumé of the present state of knowledge of the physical and chemical properties and processes of formation and decomposition of ethylene. A very full bibliography is appended.—W. G.

Natural gas; Analysis of — and the calculation and application of results. R. P. Anderson. J. Ind. Eng. Chem., 1919, 11, 299–306.

In the analysis of natural gas by the combustion method, the point at which the combustion is complete may be ascertained by the use of the following modification of the ordinary apparatus. A narrow glass tube is placed in a vertical position adjacent to the combustion pipette and its lower end is connected with a T-piece inserted in the

rubber tubing between the combustion pipette and the levelling bulb. When the gas has been passed into the pipette, the stop-cock on the bulb is closed. Contraction due to combustion is indicated by the fall of mercury level in the narrow tube and when this fall ceases the combustion is complete. The combustion pipette should be constructed of Pyrex glass. The calculation of results of combustions of natural gas according to theoretical equations is discussed; a statement of the average number of carbon atoms per mol. of paraffin hydrocarbon in the natural gas is recommended as being more logical than a statement of the percentages of two hydrocarbons forming a mixture equivalent, as regards combustion data, to the one actually burned. Tables of correction factors are given for use in correcting results obtained by the theoretical equations for differences in the molecular volumes of the gases considered, and the calculation of sp. gr. and heating value is discussed from the point of view of the theoretical and actual values.—W. P. S.

Sulphite coal. Strehlenert. See V.

Coal washing. Graham. See X.

Heating metallurgical furnaces. Lecocq. See X.

Action of coal gas on plants. Wehmer. See XVI.

Arsenical poisoning in the industries of coal and its derivatives. Bayet and Slosse. See XIXa.

PATENTS.

Refuse; Process for briquetting —. P. K. Leendertz, Amsterdam. Eng. Pat. 120,209, 15.10.18. (Appl. 16,826/18.) Int. Conv., 25.10.17.

House refuse from which the metal has been removed is pounded, pulverised, rolled, and kneaded into a plastic mass which is briquetted without a binder and dried.—W. F. F.

Peat; Means or method of treating — so as to render it more adaptable or useful as a fuel. J. W. Leadbeater, Doncaster. Eng. Pat. 124,348, 2.7.18. (Appl. 10,823/18.)

PEAT 40–50%, pitch 15–25%, and coal or coke 45–25% are separately granulated and then mixed and placed in a mould which is heated in a retort to about 800°–1000° F. (430°–540° C.), the volatile products given off being collected and separated. The residue is a smokeless fuel.—W. F. F.

Fuels; Combustion of waste —. A. C. L. Ekström, Balston Spa, N.Y. U.S. Pats. 1,295,455 and 1,295,456, 25.2.19. Appl., 6.8.18 and 26.11.18.

A FUEL for steam boiler furnaces consists of anthracite mine waste mixed with a sufficient proportion of clinkering ash to act as a binder.—W. F. F.

Coke-ovens; Regenerator for —. J. Piette, Brussels. U.S. Pat. 1,294,828, 18.2.19. Appl., 7.4.17.

Two systems of regenerators are built along the whole length of a group of ovens, one being reheated while the other is traversed by the gases for combustion. Each system consists of two channels separated by a central gallery, the latter being filled with chequer-work and provided with transverse partitions whereby pairs of juxtaposed regenerator compartments are formed. These compartments are connected with the respective channels by a series of narrow passages.—W. E. F. P.

Furnaces, gas-producers, and similar apparatus; Process of producing gas from moist fuel in — and simultaneously recovering by-products, and apparatus relating thereto. N. T. Thäberg, Malmö, Sweden. Eng. Pat. 112,443, 20.12.17. (Appl. 18,911/17.)

Moist fuel is fed into the top of a vertical retort or gas producer which is provided with a transverse funnel-shaped partition with a central opening through which the fuel passes so that there is an accumulation in both compartments. The fuel in the lower part is carbonised by external heat or partly burnt by admission of air, so that the fuel in the upper part is dried and preheated. The moist air, tar, ammonia, etc., are withdrawn from this compartment by an exhaustor or fan and passed through an ejector, the suction chamber of which is connected to the lower compartment so that the dust, tar, etc., in the gas from this compartment are separated by the moist gas. The mixed gases pass to a condenser.—W. F. F.

Producer gas and other gas furnaces; Control and regulation of combustion in —. G. Allinata, Locarno, Switzerland. Eng. Pat. 115,423, 11.4.18. (Appl. 6175/18.) Int. Conv., 3.5.17.

PRODUCER gas and other furnaces are fed with primary and secondary air which are drawn through auxiliary chambers by the draught of the furnace. Each of these chambers is provided with a control valve, the suction pressure within the chamber corresponding to the amount of air supplied. Each chamber is connected by a small pipe to a separate bell float the movement of which actuates an indicator pointer, so that by comparison of the two pointers the valves controlling the air admission may be operated to admit the proper quantities. In a modification, the two bell floats may be interconnected and may operate two indicators or a single indicator, which may be maintained in a predetermined position by adjustment of the air valves. The apparatus may be used to control the admission of gas and air to a gas-fired furnace.—W. F. F.

[Water] gas; Manufacture of —. R. J. Rew, Exeter. Eng. Pat. 124,247. (Appis. 3282, 25.2.18, and 11,318, 10.7.18.)

A HORIZONTAL retort setting used for the distillation of coal is provided with a spiral or other coil of piping above or at the side of the retorts. The discharge end of the pipe projects into the retort and the inlet end terminates outside the setting in a U-tube forming a liquid seal, and having a funnel into which water may be fed. When the distillation of the coal is complete, water is admitted to the pipe and is delivered to the retort in the form of superheated steam for the production of water-gas. In an alternative form, the piping is contained within the retort. (See this J., 1919, 99 A.)—W. F. F.

Gas-producer. F. E. Modlin, Fort Worth, Tex. U.S. Pat. 1,295,188, 25.2.19. Appl., 1.6.18.

FUEL is fed to a vertical drum comprising a fire-pot and a retort, and the gas from the upper part of the drum is passed through a horizontal superheater embedded in the fire, and thence to a storage vessel.—W. F. F.

Gas-purifiers. R. J. Milbourne, Newport, Salop. Eng. Pat. 124,994, 12.7.18. (Appl. 11,453/18.)

THE purifying material in a gas-purifier is arranged in two layers separated by a horizontal space, and the casing is provided with a junction-box at each

end, connected to the gas inlet and outlet respectively. Each junction-box is provided with openings at the top, bottom, and centre, which may be closed by detachable covers. The gas may be made to pass upwards through both layers of material or downwards, or outwards from the central space through the layers, or inwards to the central space, by covering or uncovering the appropriate openings in the junction-boxes. This arrangement obviates the use of a valve as in Eng. Pat. 2768 of 1915 (this J., 1916, 168.)—W. F. F.

Gas-purifiers with removable baffle-walls. J. Schulte, Berlin. Ger. Pat. 309,796, 7.12.16.

PURIFIERS for gases containing tar, oil, or paraffin are provided with chambers corresponding in shape with and mounted above the individual baffle-walls and also with arrangements for raising the baffle-walls. When a baffle-wall becomes choked up with tar or the like, it is raised into the corresponding chamber, and steam is introduced into the chamber, whereby the tar or the like is liquefied. Behind each baffle device a manometer is fixed which affords an exact control of the progress of the gradual choking up.—J. F. B.

Quenching coke; Method of and apparatus for —. G. A. Flood, Swaffham, and W. H. Flood, Sheffield. Eng. Pat. 124,652, 3.7.18. (Appl. 10,914/18.)

Purifiers and other gas apparatus; Gas-diverting valve of the rotating type, for use with —. R. and J. Dempster, Ltd., and W. F. Rodger, Manchester. Eng. Pat. 125,040, 9.12.18. (Appl. 20,423/18.)

Pulverous fuel; Furnace with mixing-chamber for —. K. H. V. von Porat, Stocksund, Assignor to Motala Verkstads Nya Aktiebolag, Motala Verkstad, Sweden. U.S. Pat. 1,294,730, 18.2.19. Appl., 21.12.15.

SEE Eng. Pat. 16,298 of 1915; this J., 1916, 1251.

Hydrocarbon products; Extraction of — from shales and coals. V. Z. Reed, Denver, Colo., Assignee of D. T. Day, Washington, D.C., U.S.A. Eng. Pat. 119,648, 17.5.18. (Appl. 8330/18.) Int. Conv., 28.9.17.

SEE U.S. Pat. 1,280,178 of 1918; this J., 1918, 761 A.

Cracking heavy [mineral] oils; Process of —. C. Ellis, Montclair, N.J., Assignor to Surface Combustion, Inc., Wilmington, Del. U.S. Pat. 1,295,825, 25.2.19. Appl., 1.4.12. Renewed 15.7.18. SEE Eng. Pat. 25,631 of 1912; this J., 1913, 1098.

Lubricants; Process of regenerating —. H. Wade, London. From Pittsburgh Testing Laboratory, Pittsburgh, Pa., U.S.A. Eng. Pats. 124,990 and 124,991, 11.7.18. (Appis. 11,402 and 11,407/18.) SEE U.S. Pats. 1,281,354—5 of 1918; this J., 1919, 86 A.

Drying fuel. Eng. Pat. 124,314. See I.

Hydrogen. Eng. Pat. 124,798. See VII.

Chlorhydrins [from oil-gas]. U.S. Pat. 1,295,339. See XX.

IIa.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Electrical precipitation of tar fog. Davidson.
See IIa.

German seaweeds. Albert and Krause. See VII.

PATENTS.

[*Coal*] *carbonising or distillation apparatus.*
N. H. Freeman, London. Eng. Pat. 124,015,
12.2.18. (Appl. 2462/18.)

A SERIES of flat distilling chambers are arranged in a vertical tier and a concentric vertical shaft passes through all the chambers and carries a horizontal rotating plate in each chamber. The chambers are connected by central passages through which the shaft passes. Coal or the like is fed into the uppermost chamber on to the rotating plate and is moved outwards over the plate by guides fixed to the top of the chamber. The coal passes over the edge of the plate and is moved inwards over the bottom of the chamber by guides carried by the rotating plate, to the central opening through which it passes to the next chamber. The chambers are separated by annular heating compartments containing gas burners so that the temperature of each chamber may be regulated as required, and the gaseous distillation products are withdrawn separately from each chamber.—W. F. F.

Coal, shale and the like; Low-temperature distillation of —. J. Nelson, Glasgow. Eng. Pat. 124,231, 21.12.17. (Appl. 18,983/17.)

THE mixed vapours and gases from the process of cracking hydrocarbon oils by passing them through molten lead as described in Eng. Pat. 116,304 (this J., 1918, 457 A), or the gases remaining after removing the condensable hydrocarbons therefrom, are heated to 350°–450° C., and passed with or without superheated steam through coal, shale, or the like. The material is thus subjected to low-temperature distillation and the volatile products are collected. Motor fuel may be obtained from the condensate by fractional distillation.—W. F. F.

Coal; Processes and apparatus for the distillation of —. F. Lamplough, Feltham, Middlesex, and Oil Extractors, Ltd., London. Eng. Pat. 124,294, 28.3.18. (Appl. 5511/18.)

COAL is preheated by gaseous combustion products from an auxiliary furnace, and then distilled by passing steam through it. The auxiliary furnace is connected to the vertical retort by chequerwork passages through which the hot gases pass to the retort. When the coal in the retort commences to give off gas, air is cut off from the auxiliary furnace and steam is admitted. The steam and hot gases are superheated in passing through the chequerwork to the retort, and the coal is distilled at a temperature of 300°–600° C. The volatile products together with steam and hot gases from the furnace pass from the top of the retort into the hydraulic main after which they may be separated. When distillation is complete the steam is shut off and the temperature of the furnace raised until the coke in the retort commences to burn to carbon monoxide. Steam is then re-admitted, and the volatile products are collected separately and treated for the recovery of ammonia, the carbon monoxide being used for heating purposes. The retort is provided with a rotary grate comprising two horizontal rotating shafts carrying interlocking toothed discs the teeth of which are curved

towards one another in such a way that the charge is gradually transferred through the grate. The coal is admitted to the top of the retort and the residue withdrawn below the grate by rotary valves which prevent the admission of air.—W. F. F.

Wood and the like; Carbonisation of —. H. H. Spicer, London. From J. Wells, Cairo. Eng. Pat. 124,274, 20.3.18. (Appl. 4925/18.)

THE material is fed into the top of a vertical cylindrical vessel provided with a grate, and is burned by air and steam admitted through an opening below the grate. The carbonised material is withdrawn through openings in the side of the vessel above the grate, leading to conduits which dip into a water-seal. Sliding rods project through the walls of these conduits to facilitate the passage of the carbonised material. The volatile products pass from the top of the vessel into a hood covering the upper part of the vessel and provided with means for collecting tar etc. and for discharging gas.—W. F. F.

Decolorising carbon and the preparation thereof.
H. Wade, London. From China Sugar Refining Co., Ltd., G. M. Shaw, and H. M. McTavish, Hong Kong. Eng. Pat. 124,638, 31.5.18. (Appl. 9037/18.)

SAWDUST, wood chips, or other fibrous vegetable material is impregnated with milk of lime containing calcium hydroxide in the proportion of not more than 40% of the vegetable material, and heated in a closed retort to 1000° C. The carbonised material is washed with a 5% solution of hydrochloric acid to remove lime, and then with water to remove the acid, and finally dried. The product is suitable for decolorising sugar solutions or syrups.—W. F. F.

Arc lamps. G. Westercamp, Paris. Eng. Pat. 124,453, 5.1.16. (Appl. 177/16.)

AN arc lamp, e.g., a searchlight, is provided with a device for varying the current supplied and the distance between the carbons when required to burn at a lower candle power, and the negative carbon is provided with a "wick" of known composition (e.g., powdered carbon agglomerated with alkali silicate) or with an axial passage through which liquid or gas may be supplied to stabilise the arc.
—W. F. F.

Electric lamps; Method of drawing wire filaments for incandescence —. F. G. Keyes, East Orange, N.J., Assignor to Cooper Hewitt Electric Co., Hoboken, N.J. U.S. Pat. 1,293,116, 4.2.19. Appl., 11.2.14.

METALLIC tungsten is deposited electrolytically on a fine tungsten wire which is then hot-drawn through dies of an alloy of tungsten, iron, and carbon, with a lubricant of talcum powder.
—W. F. F.

Electric lamp; Incandescence —. M. A. Hoyt, Bloomfield, N.J., Assignor to Westinghouse Lamp Co. U.S. Pat. 1,293,781, 11.2.19. Appl., 11.7.16.

THE tungsten filament of an incandescence electric lamp is joined to a nickel leading-in wire by pressing the two together and simultaneously passing an electric current through the joint.—W. F. F.

III.—TAR AND TAR PRODUCTS.

Fatty acids produced by the oxidation of lignite tar oil; Nature of the —. C. Harries. Ber., 1919, 52, 65—72.

Formic, acetic, propionic, oxalic, palmitic, stearic, and myristic acids and probably heptole and octole acids are produced by the decomposition of the ozonides obtained from purified lignite tar oil (Harries, Koetschau, and Fonrobert, this J., 1917, 539). The complete absence of the C_4 — C_8 fatty acids is remarkable.—C. S.

Coumarone resins. Marcussen. See XIII.

Arsenical poisoning in industries of coal and its derivatives. Bayet and Slosse. See XIXB.

Catalytic dehydrogenation. Sabatier and Gaudion. See XX.

PATENTS.

Coal tars and the like; Production of oils from — and also carbon, and pitch which may be free, or relatively free, from uncombined carbon. J. L. Major, Kingston-upon-Hull. Eng. Pat. 17,140, 6.12.15.

THE material to be treated (coal-tar, blast-furnace tar, etc.) is agitated with a solvent (petroleum, shale oil, naphtha, etc.), the solvent employed and its quantity depending upon the nature of the tar, and whether the residue from the extraction is required to be pitch, or asphaltum and free carbon. By using a relatively large proportion of solvent, the residue consists almost entirely of free carbon. After agitation the mass is allowed to stand, and the supernatant layer is removed and distilled to recover the oil or oil and asphaltum. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 736 of 1894, 6739 of 1901, 20,231 of 1906, 16,908 of 1909, and 3003 and 10,958 of 1912, and in pursuance of Sect. 8, Sub-sect. 2, to Eng. Pat. 24,313 of 1914; this J., 1895, 24; 1902, 699; 1907, 1190; 1910, 1368; 1912, 1190; 1913, 666; 1916, 170.)—S. S. A.

Benzol and other products from acid tars obtained in refining operations; Recovery of —. F. and H. T. Thorp, Whitefield. Eng. Pat. 124,605, 13.4.18. (Appl. 6306/18.)

WASTE acid tar obtained during the refining of benzol, toluol, solvent naphtha, etc., is washed by agitating it with 0.5–1 volume of water. On allowing to stand a pasty mass comprising tar oil and resinous substances separates above the acid liquor. The acid is run off and the pasty mass, after being well washed with water, is steam distilled for the recovery of benzene, toluene, etc. The residue, consisting of resinous substances, is transferred to a filter, washed free from acid, and dried.—S. S. A.

IV.—COLOURING MATTERS AND DYES.

Resinous substances [for production of dyestuffs]; Process for the manufacture of — by the action of the sodium soap of γ -pinic acid on naphthols, aminonaphthols, and their sulphonic acids. L. Paul. Farben-Zeit., 1917, 22, 464–465. Chem. Zentr., 1919, 90, II., 64.

SOLUBLE compounds are obtained by warming a solution of sodium γ -resinate with naphthols or aminonaphthols, whereas the sulphonic acids in dilute solutions give emulsions and in concentrated solutions resinous precipitates which can be crystallised from alcohol. On heating 10 grms. of β -naphthol with 150 c.c. of a 10% solution of sodium γ -resinate

a solution is obtained which sets to a mass of crystals on cooling. This is filtered off and washed with water until the washings are clear. About 30% of the β -naphthol is thus obtained combined with the resin soap as a soluble compound, which may be salted out of the mother liquor with sodium chloride and out of the washings with potassium chloride. This compound can be fixed on cotton and forms azo dyestuffs with diazo and tetrazo compounds, either in solution or on the fibre. These resinate dyestuffs possess many superior properties over the resin lakes prepared from basic dyestuffs as regards fastness to light and washing. On heating the resin soap solutions with β -naphthol-sulphonic acid (Schaeffer's acid) syrupy or lumpy masses separate; this product also forms insoluble resinate azo dyestuffs which can be produced on unmordanted cotton. A similar resin compound is produced with "R-acid" and a range of insoluble azo colours with bluish shades can be prepared. Crystalline sodium γ -resinate compounds with aminonaphthol- γ -sulphonic acid, β -naphthol- γ -disulphonic acid and aminonaphtholdisulphonic acid-II can also be obtained.—J. F. B.

Colour lakes; Theory of —. O. Baudisch. Ber., 1919, 52, 146–147.

A CLAIM of priority over Scholl and Zinke in regard to their work on the action of potassium ferri-cyanide on alizarin and the constitution of hydroxy-anthraquinones (this J., 1918, 763A).—C. S.

PATENT.

Sulphur dyestuff. M. Wyler, and Levinstein, Ltd., Manchester. Eng. Pat. 124,589, 28.3.18. (Appl. 5519/18.)

A DYE-STUFF soluble in sodium sulphide and dyeing cotton in reddish-brown shades fast to washing and chlorine is prepared by melting acenaphthene with sulphur at 250°–300° C. Thus, a mixture of 1 part of acenaphthene and 3½ parts of sulphur is heated at 250°–300° C. till the melt becomes thick and soluble in sodium sulphide. It is then cooled, powdered, dissolved in a boiling 10% solution of sodium sulphide, and the dyestuff precipitated with hydrochloric acid, collected, washed and dried.—S. S. A.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Sulphite-coal. R. W. Strehlenert. Pulp and Paper Mag., 1918, 16, 671–672, 687–689, 709–710, 735–736.

THE author's scheme for the manufacture of a fuel from sulphite-cellulose waste liquor, which was described by B. Johnsen (this J., 1918, 130 T–131 T) is set forth in more complete detail. The process was first outlined in 1913 (this J., 1913, 652) but has been the subject of recent improvements. As originally designed, the presence of the merest traces of certain metals, e.g. 0.002% of iron, sufficed to inhibit the precipitation of the lignin. This and other defects have been remedied by first heating the liquor almost to its critical temperature, i.e. the temperature at which it begins to liberate large quantities of its combined SO_2 , before admitting the air. Oxidation during the heating stage is prevented by pumping exhaust digester gases into the autoclave, so that a gas pressure of 1–2 kilos. per sq. cm. exists at the beginning of the heating. Then at the critical point air is admitted and oxidation and decomposition take place practically simultaneously. The concentration of dry substance for the optimum yield is 16–17%; this may be obtained when digesting the wood by the method of circulation of the liquor, but in the ordinary way of heating by indirect steam, the concentration does not

exceed 11%. Considerable improvement in the yield may, however, be obtained by extracting the liquor from the pulp by the process of systematic diffusion. About 75% of the organic matter in the lye can be precipitated at the maximum, and 72–74% is easily obtained; the remaining 25% is not in a form which is susceptible to the treatment. The fuel obtained normally contains 17–18% of ash, but this percentage may be considerably reduced by special treatment. The physical condition of the precipitated lignin is closely connected with the yield and a correct treatment giving the maximum yield gives also a quickly draining granular precipitate which can be drained to a content of 65% of dry substance. The autoclaves for the treatment of waste lyes which have previously been used for alcohol manufacture are constructed of lead-lined material. The oxidation of SO_2 must be restricted to a very small amount; consequently the consumption of air is only small and the autoclave space may be utilised for liquor to about 75% of its total capacity. To ensure minimum oxidation, it is necessary to work under high pressure and at a high temperature. The critical temperature of the liquor ranges between 170° and 190°C . and the exothermic reaction, which takes place very suddenly, may carry the temperature up to above 200°C . The liquor must not be allowed to boil, as this would involve a large loss of heat; consequently excess pressure up to a maximum of about 20 kilos. per sq. cm. is prescribed. The loss of organic matter in the filtrates amounts theoretically to 25% of the total. It is found, however, that a considerable proportion of this may be recovered by using the liquor for the hydrolysis of peat by the "wet carbonising" process. The hydrolysis of the peat is thereby facilitated and the organic matter absorbed from the sulphite fuel filtrates increases the yield of peat fuel. According to the quantity of free acid present, the hydrolysis is effected at 140°C . or lower and the mother liquor is used again until substantially exhausted.—J. F. B.

PATENTS.

Cotton-seed hull fibre; Method of purifying — F. W. Stockton, Pittsburgh, Pa., Assignor to East St. Louis Cotton Oil Co., National Stock Yards, Ill. U.S. Pat. 1,295,078, 18.2.19. Appl., 18.9.17.

COTTONSEED hull fibre is softened by boiling it in a 4% solution of caustic soda for about 5 hours. The boiled fibre is passed between rollers in order to disintegrate the associated hull particles, and then subjected to a cleaning operation to separate the fine, disintegrated hull particles from the fibre. —L. L. L.

Coating composition and process of applying same, intended more particularly for coating aeroplane cloths. Treatment of fabrics, particularly of aeroplane fabrics. T. F. Tesse, Paris. Eng. Pats. (a) 124,763 and (b) 124,844, 3.1.16. (Appls. 71/16 and 4284/17.)

(a) AEROPLANE fabrics are treated with a dilute solution of cellulose acetate in acetone and methyl acetate, containing a small proportion (2–5%) of a solvent of high boiling point, such as carvacrol, eugenol, isoeugenol, safrol, isosafrol, methyl-eugenol; tri-acetin, glycerol benzoate, or benzyl alcohol, or a mixture of them may also be added. The high-boiling solvents impart a high degree of suppleness to the coating. The addition of an inert substance, such as zinc oxide (from 2 to 5% on the solvent), produces a smooth, impervious, opaque enamel, absolutely unaffected by spirits, oils, and water, and imparts to the composition the property of tensioning the fabric.

(b) The fabric is treated with one or several

coats of cellulose ester free from high-boiling solvents, in order to give to the fabric the desired tension and impermeability. Following this, one or several layers of a supple coating composition of cellulose ester along with a high-boiling solvent are applied, and finally one or more coatings of cellulose ester, particularly cellulose acetates, free from or containing only very small quantities of solvents of high boiling point.—L. L. L.

Fabrics; Method of producing pyroxylin coated — W. E. Masland, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,267,785, May 28, 1918. Date of appl., Sep. 3, 1914. Renewed Oct. 4, 1917.

A FABRIC is coated first with a pyroxylin "jelly" composition and then with a plastic pyroxylin composition of such consistency as to constitute substantially a surface coating; the coated fabric is wound tightly upon a roll before the coating has set, the resulting pressure being maintained until setting has taken place, so as to cause the coating to adhere firmly to the fabric.—J. F. B.

Packing and process of manufacturing same. C. E. Vance and J. A. Vetter, Pittsburgh, Pa. U.S. Pat. 1,295,241, 25.2.19. Appl., 26.10.17. Renewed 9.1.19.

A PROCESS of manufacturing hydraulic packing consists in treating fibres, from which the moisture has been expelled, with a cellulose solution to render them waterproof and then coating the fibres with a lubricant.—L. L. L.

Paper; Means for making — J. T. Tong, Chester, Pa., Assignor to Scott Paper Co. U.S. Pat. 1,295,636, 25.2.19. Appl., 26.10.17.

A PAPER-MAKING machine is provided at the wet end with a "doctor," which gives an irregular ribbed condition to the paper web, and at the drying end with a conditioning device consisting of a pair of rubber rollers, between which the dried paper web passes, so that the ribbed portions of the web are crushed. The paper is thus rendered more pliable, and acquires a more cloth-like handle. —L. L. L.

Resin size. U.S. Pat. 1,292,721. See XIII.

Leather substitute. U.S. Pat. 1,291,180. See XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

"Dry" mordanting, and dyeing of mordant dyes (in non-aqueous solution). M. Fort. J. Soc. Dyers and Col., 1919, 35, 100–101.

THE difficulty of "dry" chroming of animal fibres was overcome by the use of an ethereal solution of perchromic anhydride. Salts of this compound with bases, e.g. pyridine, are obtained by reaction in ethereal solution, and it appears probable that a like union takes place with the basic constituents of wool. Mordanting is effected by immersing the wool in a blue ethereal solution of the peroxide, prepared by treating bichromate with dilute sulphuric acid in the presence of hydrogen peroxide and then extracting with ether. The chromed wool has a bluish colour, somewhat similar to that of the ethereal solution of the chromium peroxide. In a dry atmosphere the chromed wool remains blue or slate-coloured many hours, but in presence of sufficient moisture it turns yellow. The whole of the chromium may be exhausted from the ethereal solution by use of fresh batches of wool. The blue mordant has stronger oxidising proper-

ties than the well-known yellow chrome mordant, but it may be reduced to the yellow condition by treatment with sulphur dioxide. Mordant colours are applied to the chromed wool, similarly to the acid colours from a cresol petroleum bath (see this J., 1919, 9A). As with acid colours, a little water is essential along with a mere trace of formic acid. The shades produced are fast to rubbing, hot and cold water, and moderately resistant to soaping.—L. L. L.

Resinate dyes. Paul. See IV.

PATENTS.

Boiling, bleaching, dyeing, sizing, or similarly treating yarns or fabrics; Machines for —. J. Bright and Bros., Ltd., and J. Evans, Rochdale. Eng. Pat. 125,025, 29.10.18. (Appl. 17,620/18.)

A MACHINE of the box or beck type for boiling, bleaching, dyeing, sizing, or similarly treating yarns or fabrics is fitted with counterbalanced guide rollers, placed within the beck, and arranged to rise and fall within certain predetermined limits under variations of tension on the yarns or fabrics. A locking device may be supplied for locking the rollers in any desired position. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 1548 of 1870.)—L. L. L.

Dyeing apparatus. W. J. Going, Amsterdam, N.Y., Assignor to General Textile Machinery Co., Yardley, Pa. U.S. Pat. 1,295,155, 25.2.19. Appl. 12.4.17.

THE apparatus comprises a dyeing chamber within a vat, provided with propellers for the circulation of the liquor in the vat, and with an automatic arrangement, such as a cam, whereby the circulation is reversed at predetermined intervals. A means of changing the interval between the reversals is also provided, and by a suitable device the dye liquor may be directed downwards on the top of the material in the vat, and circulated between the top and bottom of, or horizontally above and below, the dyeing chamber in the vat. Horizontally spaced baffles, consisting of triangular members with the apex of the triangle downwards, are used to present an inclined surface for deflecting the circulating fluid.—L. L. L.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Double salts of calcium and potassium and their occurrence in leaching cement mill flue dust. E. Anderson. J. Ind. Eng. Chem., 1919, 11, 327—332.

DOUBLE sulphates of calcium and potassium can be obtained from solutions containing calcium sulphate and potassium sulphate; these double salts are potassium mono-calcium sulphate, or syngenite, $K_2SO_4 \cdot CaSO_4 \cdot H_2O$, and potassium penta-calcium sulphate, $K_2SO_4 \cdot 5CaSO_4 \cdot H_2O$. In a solution containing 2.67% of potassium sulphate, syngenite and calcium sulphate are stable as solid phases below $31.8^\circ C$; if potassium sulphate is added to such a solution, more syngenite will form. At $31.8^\circ C$, potassium penta-calcium sulphate can form and at this temperature the solid phases gypsum, potassium penta-calcium sulphate, and syngenite can exist in equilibrium with the solution, the latter containing 3.5% of potassium sulphate and being saturated with calcium sulphate. During leaching of cement mill flue dust for the recovery of potash,

the conditions may be so adjusted as regards time of contact and solution concentration that the formation of double salts may be avoided.—W. P. S.

Iron and oxygen as necessary agents for the reduction of alkali nitrites by auto-oxidisable compounds. Nitrate and nitrite assimilation. XIV. O. Baudisch. Ber., 1919, 52, 35—40.

WHEN an aqueous alkaline solution of sodium nitroprusside is boiled in the absence of air or oxygen, no nitric oxide is liberated, but this gas is liberated in large quantity directly oxygen is admitted to the system. Similar results are observed when a solution of sodium carbonate and potassium nitrite is boiled with pentacyanoammineferric sodium, $[(CN)_5FeNH_2]Na$, or with potassium ferrocyanide; in the case of the last-named compound the addition of a little pyridine or phloroglucinol greatly accelerates the evolution of the nitric oxide. The fact that iron as well as oxygen is necessary for the reduction of alkali nitrite (this J., 1918, 556A) is therefore now explicable. The whole process of the reduction of alkali nitrite is a replacement of inorganic or organic groups co-ordinatively attached to the iron atom by the NO-group of the alkali nitrite and the subsequent elimination of this group by oxygen on warming. (See also J. Chem. Soc., 1919, 1, 237.)—C. S.

Iron and oxygen as necessary agents for the reduction of alkali nitrates. Nitrate and nitrite assimilation. XV. O. Baudisch. Ber., 1919, 52, 40—43.

AN alkali nitrate is unaffected by boiling in alkaline solution with ferrous carbonate or hydroxide in the absence of oxygen, but is reduced through the alkali nitrite to ammonia directly oxygen is admitted. Alkali nitrite is reduced to ammonia even in the absence of oxygen. The author explains the phenomenon by means of his peroxide formula of alkali nitrates. (See this J., 1916, 736; also J. Chem. Soc., 1919, 1, 238.)—C. S.

Magnesite; Analysis of —. V. Macri. Boll. Chim. Farm., 1918, 47, 301—302.

FIVE grms. of calcined magnesite or 10 grms. of the natural product is digested with hydrochloric acid, and ammonia added to the hot solution until a persistent turbidity is produced. The liquid is then boiled, allowed to settle, and filtered, the filter ignited, and silica determined in the residue after treatment with hydrochloric acid. In the filtrate aluminium and iron are determined and in the filtrate from these, together with that from the first operation, the lime and magnesia are determined in the usual way. The magnesium is more conveniently weighed as the double phosphate dried at $100^\circ C$. than as the pyrophosphate after ignition. The calcium is preferably precipitated as sulphate in presence of alcohol, or the following rapid method of separating it for estimation may be used: A hydrochloric acid solution of the mineral, containing not more than traces of free acid, is introduced, together with the insoluble residue, into a measuring flask, the volume made up to the mark with water, and ammonia solution added. The flask is then closed and the liquid mixed and allowed to settle, the calcium being determined in an aliquot part of the clear liquid. This procedure gives concordant results which are rather lower than those obtained when the calcium is precipitated in presence of magnesium.—T. H. P.

Bromate and iodate; Iodometric estimation of —. I. M. Kolthoff. Pharm. Weekblad, 1919, 56, 426—438.

IN the titration of bromate-iodide solution with thiosulphate solution it is essential that sufficient

acid be present if titration is performed immediately after the addition of the iodide. A minimum concentration of $N/2$ for hydrochloric acid is required and of $N/1$ for sulphuric acid. When too little acid is present thiosulphate is oxidised by bromate directly to sulphate. The error arising from this cause may be avoided by postponing titration for a few minutes until the reaction between bromate and iodide is complete, or by catalysing the reaction by the addition of ammonium molybdate. This catalyst is effective both in strongly acid and in weakly acid solutions. The reaction between iodate and iodide takes place much more rapidly than that between bromate and iodide, hence the above precautions are unnecessary in estimating iodates iodometrically.—W. S. M.

Manganates and permanganates. I. Course of the reaction between manganese dioxide, potassium hydroxide, and oxygen, and the manufacture of potassium manganate. H. I. Schlesinger, R. D. Mullinix, and S. Popoff. J. Ind. Eng. Chem., 1919, 11, 317–323.

WHEN manganese dioxide is heated with potassium hydroxide in a current of air to produce potassium manganate, the reaction frequently stops before the maximum oxidation stage has been reached; this may be avoided by moistening and re-heating the mixture. The use of moist air is also recommended. The yield of potassium manganate varies with the proportion of potassium hydroxide present; at about 300° C., practically all the manganese dioxide is converted into manganate when 2.5 mols. of potassium hydroxide is used for each mol. of manganese dioxide. The statements by Sackur (see this J., 1910, 347; 1911, 487) that in this reaction mangan-manganates and not manganates are always formed, and that the maximum yield is only 60%, are incorrect. Larger proportions of alkali, however, decompose the manganate into a mangan-manganate similar to that postulated by Sackur. The yield of manganate is lowered considerably if sodium hydroxide is substituted for potassium hydroxide. It is important to pulverise the manganese ore very finely and to keep the mixture in a fine condition in the kilns in order to obtain the highest possible yields. Recovered manganese dioxide sometimes gives low yields, but its effectiveness for the manufacture of manganate may be restored by washing it with water or boiling it with dilute nitric acid.—W. P. S.

Seaweeds; Investigation of German — R. Albert and M. Krause. Chem.-Zeit., 1919, 43, 97–99.

By boiling the stalks of various species of *Fucus* with water or very dilute acetic acid under pressure, up to five atmos., the external pectinous layer was removed, and the fibres liberated. Attempts to use these for textile purposes have as yet been inconclusive. Preliminary experiments on the utilisation of seaweeds in the manufacture of alcohol were unsuccessful. On the other hand not only species of *Fucus*, but also various species of *Laminaria*, especially *L. saccharina* and *L. digitata*, are suitable for fodder, and, after drying, can be ground to a coarse powder which keeps well. Of the various algae examined the only one which appeared suitable for the manufacture of agar-agar was *Chondrus crispus*. The amount of ash obtained from various kinds of seaweeds from Heligoland ranged from 17.7% in *F. serratus* to 52.37% in the roots of *L. hyperborea*, whilst the ash contained the following amounts of iodine:—*L. hyperborea*, roots, 1.095; stalks, 2.962; leaves, 4.247; *L. saccharina*, leaves, 0.32 and 0.97; *Halidrys siliquosa*, 1.03; *Ascophyllum nodosum*, 0.79; *Himantalea lorea*, 0.004; *F. serratus*, 0.536; *F.*

vesiculosus, 0.187 and 0.217; *L. digitata*, 1.46 and 2.55; *Chondrus crispus*, 0.3%; and *Ceramium rubrum*, traces. It is estimated that about 10,000 tons of the dried palm seaweed (*L. hyperborea*) would supply the whole of the German demand for iodine, and of this quantity at least 1000 tons could be obtained from Heligoland. With reference to the proposed extraction of potash from seaweeds in the United States it is pointed out that in 1913, 1,000,000 tons of potassium salts was imported into that country from Germany, and that to obtain that quantity about 90,000,000 tons of fresh seaweed would be required. After extraction of the iodine, the most rational course is to use the whole of the residual ash as a fertiliser. By carbonising seaweed in closed vessels considerable quantities of ammonia and acetic acid may be obtained (e.g. 25–40 kilos. of ammonium sulphate and 3–9 kilos. of calcium acetate from one ton of air-dried seaweed).—C. A. M.

Selenium and its applications. L. Ancel. Chim. et Ind., 1919, 2, 245–250.

AN account is given of the methods in use for extracting selenium from its ores. All the scientific and technical applications of selenium, with one or two minor exceptions, depend upon the increase of the electrical conductivity of the element under the influence of light. The different allotropic forms differ widely in their sensitiveness to light, and attention is particularly directed to the very sensitive variety of vitreous selenium previously described by the author (this J., 1915, 379). Descriptions of different types of selenium cells are given, and of the methods used for determining their sensitiveness. Selenium cells have been used successfully for controlling the draught in factory chimneys. A selenium cell is placed in a suitable position in the chimney, and is illuminated by a lamp situated on the opposite side of the flue. The amount of light falling on the cell, influenced by the quantity of smoke passing between the lamp and the cell, determines the strength of the current passing through the cell, and the current variations are indicated by a recording galvanometer. The same principle has been applied to the control of the manufacture of sulphuric acid by the contact process, the degree of transparency of the gases in the reaction tube being recorded by means of a selenium cell and galvanometer. An account is also given of experiments on the use of selenium cells for wireless telephonic and telegraphic purposes, for determining the position of hostile artillery, for the telegraphic transmission of illustrations and pictures, and for recording variations in the intensity of the light emitted by the sun during an eclipse. Selenium has also been used in place of sulphur for vulcanising rubber, and in glass to obtain a pale violet colour.—E. H. R.

Decarbonation of dolomite. Eakins. See IX.

Ammonia from liquid manure etc. Lemmermann and Wiessmann. See XVI.

Calomel. Duret. See XX.

Precipitation of sulphates. Koelsch. See XXIII.

PATENTS.

Sulphuric acid; Chambers used in the manufacture of — W. G. Mills, C. T. Packard, and E. Packard and Co., Ltd., Ipswich. Eng. Pat. 124,852, 15.1.18. (Appl. 572/18.) Addition to Eng. Pat. 12,067, 23.5.13.

The lead chamber of the shape of a frustum of a cone or a pyramid for the manufacture of

sulphuric acid described in Eng. Pat. 12,067 of 1913 (this J., 1914, 692) is fitted with one or more vertical cooling shafts open both at the top and bottom. The walls of the shaft slope inwards from top to bottom and are supported by a framework in a similar manner to the walls of the chamber. Water is caused to flow down the sides of the shaft and of the chamber, and the lead rings supporting the sides to the framework form troughs out of which the water flows through orifices into a gutter beneath with a notched edge, thus causing an even distribution. Gases are led into the chamber through a sloping inlet directed towards the floor, and pass out by a pipe at the top.—L. A. C.

Hydrogen fluoride; Process of making — R. M. Catlin, Franklin, N.J., Assignor to Catlin Shale Products Co., Wilmington, Del. U.S. Pat. 1,293,703, 11.2.19. Appl., 9.6.17.

SOLUTIONS containing fluorine in combination with silicon are treated with an iron oxide and filtered. The ferric fluoride, obtained from the filtrate by crystallising, is treated with superheated steam and the evolved hydrogen fluoride absorbed in water.—B. V. S.

Hydrofluoric acid; Apparatus for condensing and utilising — R. S. Sherwin, East St. Louis, Ill., Assignor to Aluminium Co. of America, Pittsburgh, Pa. U.S. Pat. 1,294,546, 18.2.19. Appl., 13.1.15.

THE apparatus comprises two or more absorption towers of material resistant to hydrofluoric acid, which are fitted with transverse baffle-plates placed successively further apart from the top downwards. Absorbing liquid is introduced at the top of each tower, flows over the baffle-plates, and is discharged from the bottom of the tower, which stands in a liquid seal to exclude air. The inlet and outlet are provided with independent means of cooling the liquid as it enters and leaves the tower. Gas is admitted near the bottom of the first tower and is withdrawn, by a suction apparatus placed at the end of the series, from an outlet near the top, whence it is conveyed to the bottom of the second tower. The liquid drawn from the bottom of the second tower is collected for recirculation through the tower.—S. S. A.

Ammonia; Production of — from cyanamide. Norsk Hydro-Elektrisk Kvaestofaktieselskab, Christiania, Norway. Eng. Pat. 120,034, 23.7.18. (Appl. 12,000/18.) Int. Conv., 4.10.17.

IN the production of ammonia by heating calcium cyanamide and sodium carbonate with water in an autoclave, the water is preheated to at least 40° C. before it is brought in contact with the calcium cyanamide.—L. A. C.

Aluminium hydroxide and ammonium sulphate; Production of pure — J. P. A. Larson and W. D. Bergman, Stockholm. Eng. Pat. 120,550, 26.5.18. (Appl. 13,873/18.) Int. Conv., 9.10.17.

ALUMINOUS material containing also silicon and iron compounds is treated with sulphuric acid, the solution treated with sulphurous acid or other suitable reducing agent, heated to about 100° C., and mixed with the calculated quantity of ammonium sulphate. The resulting solution of ammonium alum is freed from undissolved matter and allowed to crystallise, with stirring, so as to separate the alum as a fine powder. This is washed and treated with ammonia and the aluminium hydroxide and ammonium sulphate separated by the usual means.—B. V. S.

Sulphate of ammonia; Manufacture of — J. T. Sheard, Birley Carr. Eng. Pat. 124,946, 13.5.18. (Appl. 7972/18.)

THE free acid content of ammonium sulphate is reduced to 0.14% by directing a spray of water on to the mass as it is discharged from the saturator on to the drainer, thereby diluting the acid mother liquor enveloping the crystals.—S. S. A.

Mercuric oxide; Manufacture of — Elektrizitätswerk Lonza, Assignees of E. Kuhn, Basle, Switzerland. Eng. Pat. 122,195, 6.1.19. (Appl. 888/19.) Int. Conv., 7.1.18.

MERCURY is dropped into liquid N₂O₄ contained in a closed cast iron vessel provided with a reflux condenser and agitator, and oxygen is passed in simultaneously, mercurous nitrate being formed. On completion of the reaction the condenser is disconnected, and the excess of N₂O₄ is distilled over to a similar vessel. The remaining mercurous nitrate is decomposed by heat, with agitation, and the NO₂ evolved collects as N₂O₄ in the second vessel.—S. S. A.

Zinc oxide furnaces or kilns. A. T. Mirza, Bombay, India. Eng. Pat. 124,038, 11.3.18. (Appl. 4272/18.)

METALLIC zinc is placed on an iron plate which forms the bottom of an oven heated from below, the zinc being kept at about its melting point. A stream of air, heated by passing through pipes in the upper part of the furnace chamber, is directed across the surface of the hot zinc. A rotary stirrer keeps the mass in motion and ensures complete oxidation.—B. V. S.

Potassium salts; Separation and recovery of — from commercial nitrate of soda containing such salts. F. A. Freeth, Great Crosby, and H. E. Cockledge, London. Eng. Pat. 124,513, 25.2.16. (Appl. 2847/16.)

CRUDE sodium nitrate containing potassium salts is digested with sufficient water or liquor from a previous extraction to dissolve the potassium salts and to yield a solution saturated or nearly saturated with the potassium salts. The temperature of digestion should be as high as practicable. The solution is separated from the undissolved sodium nitrate at the temperature of digestion, and, if saturated with potassium salts, it is diluted with sufficient water to keep the sodium nitrate in solution at the temperature to which the solution is to be cooled; it is then cooled to the desired temperature, when pure potassium nitrate crystallises out. If the solution is not saturated with potassium salts, it is concentrated until it is saturated at a high temperature, e.g., 100° C., and, after removal of any sodium nitrate which crystallises out, it is treated as before.—L. A. C.

Potassium nitrate; Separation of — from sodium nitrate. C. W. Bailey, H. S. Denny, and A. T. Jefferis, Langwith. Eng. Pat. 124,960, 5.6.18. (Appl. 9283/18.)

CRUDE Chile saltpetre is lixiviated with a hot solution of sodium and potassium nitrates, thereby extracting potassium nitrate from the crude salt and obtaining a liquor which on cooling deposits a mixture of sodium and potassium nitrates from which sodium nitrate is removed by treatment with water, leaving a residue of potassium nitrate practically free from sodium salt. For example, the crude nitrate is lixiviated at about 65° C. so as to obtain a liquor containing 100 parts by weight of sodium nitrate, 100 parts of potassium nitrate,

and 50 parts of water, which on cooling deposits 20 parts by weight of sodium nitrate and 50 parts of potassium nitrate. The precipitated salts on treatment with 10 parts by weight of water, yield a liquor containing 20 parts by weight of sodium nitrate, 10 parts of potassium nitrate, and 10 parts of water, leaving a residue of 40 parts of potassium nitrate. The united filtrates are used for the lixiviation of further quantities of crude nitrate.—S. S. A.

Sodium nitrate and potassium nitrate; Process for separating — G. C. Given and R. H. Barteaux, Tamaqua, Pa., Assignors to Atlas Powder Co., Wilmington, Del. U.S. Pat. 1,294,788, 18.2.19. Appl., 11.7.18.

A SOLUTION of the two salts is evaporated under reduced pressure at a temperature between 80° C. and 95° C. to effect fractional crystallisation of the two salts.—S. S. A.

Alumina, sodium and potassium aluminates, sodium and potassium carbonates, and potassium chloride; Process for the manufacture of — E. E. and P. C. Dutt, Jubbulpore, India. Eng. Pat. 124,553, 22.3.18. (Appl. 5072/18.)

THE process is a combination of the processes described in Eng. Pats. 116,438, 118,155, and 118,156 (this J., 1918, 496 A, 580 A), a duplex rotary furnace consisting of two rotary chambers connected by a flue being used for carrying out the reactions. Arsenious oxide vapour is led into the first chamber which is charged with a mixture of 800 parts of calcined clay containing 30–35% Al_2O_3 and 350 parts of sodium chloride or 450 parts of potassium chloride. The arsenious chloride generated passes into the second chamber which is filled with small pieces of felspar, and the arsenious oxide regenerated passes out with the waste gases and is condensed in a series of flues. The residues from the chambers are treated separately as described in the previous patents.—L. A. C.

Alumina, sodium and potassium carbonates, sodium and potassium aluminates, magnesia, and calcium chloride; Process for the manufacture of — E. E. and P. C. Dutt, Jubbulpore, India. Eng. Pat. 124,554, 22.3.18. (Appl. 5073/18.)

IN the process described in Eng. Pat. 124,553 (see preceding abstract), the second chamber is charged with dolomite instead of with felspar, and the arsenious chloride generated in the first chamber is mixed with steam as it passes along the flue connecting the two chambers, with the formation of hydrochloric acid and arsenious oxide. The dolomite, which is heated to 450°–650° C., is converted into magnesia and calcium chloride.

—L. A. C.

Potash; Process for obtaining water-soluble — W. D. Richardson, Chicago, Ill. U.S. Pat. 1,295,601, 25.2.19. Appl., 28.8.15.

INSOLUBLE silicate rock containing potash is mixed in the presence of water with a fluoride-bearing mineral and an acid capable of decomposing the fluoride, the interaction of the ingredients being maintained without the external application of heat.—S. S. A.

Calcium nitrate; Manufacture of — from calcium chloride and sodium nitrate. J. G. Gillbert, London. Eng. Pat. 124,780, 27.3.16. (Appl. 4483/16.)

EQUIVALENT amounts of calcium chloride and sodium nitrate are dissolved in the concentrated mother liquor from a previous operation, the quantities being adjusted to yield a solution saturated

with respect to calcium nitrate and sodium chloride at as high a temperature as may be practicable, e.g., 80° C. The precipitate of sodium chloride is removed at or slightly above that temperature, and sufficient water added to the liquor both to adjust the ratio of sodium chloride to water to that in the original solution and also to provide four mols. of water for the excess calcium nitrate present. Calcium nitrate tetrahydrate is precipitated when the solution is cooled below 30° C., and is removed and washed with a little water or calcium nitrate solution. The mother liquor is then concentrated sufficiently to remove the water added to adjust the ratio of sodium chloride to water and used again in the cycle of operations.

—L. A. C.

Manganese dioxide; Manufacture of — E. E. and P. C. Dutt, Jubbulpore, India. Eng. Pat. 124,977, 25.6.18. (Appl. 10,478/18.)

A MIXTURE of manganese ore (e.g., pyrolusite) and sodium or potassium hydroxide is roasted at 600°–750° C. in a current of air in a reverberatory furnace, thereby producing sodium or potassium manganate. On dissolving the cooled mass in water, the alkali manganate passes into solution, and any ferrite present is decomposed yielding ferric and alkali hydroxides. The manganate solution is decanted from the insoluble matter (iron and silica), evaporated to dryness, and heated at 500° C. in a current of steam in a retort. A mixture of manganese dioxide and alkali hydroxide is produced which is lixiviated with water, and the residual manganese dioxide is washed free from alkali and dried.—S. S. A.

Acid alkali sulphates; Recovery of acid from — G. S. Rogé, Madras, India. Eng. Pat. 124,988, 9.7.18. (Appl. 11,253/18.)

ABOUT 5% of pulverised charcoal or sawdust is incorporated with acid sodium sulphate and the mixture is formed into lumps or slabs which are burned in a kiln with free access of air, the acid gases being collected in the usual manner.—S. S. A.

Hydrogen; Apparatus for the manufacture of — T. D. Mackie, Pulham St. Mary, Norfolk. Eng. Pat. 124,798, 5.4.16. (Appl. 5036/16.)

A WATER-GAS generator is surrounded by an annular cast iron chamber containing iron ore or iron oxide, around which are flues in which waste gases from the generator circulate freely, the heating of the chamber being regulated by secondary air supplies. Heat regenerators, worked on the Siemens principle, for heating the air required for blowing the generator and the secondary air, and a steam superheater are also built around the generator. The annular chamber is provided at the bottom with inlet valves for the admission of water-gas and steam, and with outlet pipes for hydrogen at the top. The water-gas passes at first into a holder, and when sufficient has been made and the iron ore is at 700°–800° C., water-gas is admitted at the bottom of the ore chamber until the ore is reduced, when the supply of water-gas is shut off and steam is admitted, the hydrogen generated being led into a holder. Reduction of the ore and production of hydrogen are carried out alternately until the water-gas is used up, the necessary temperature within the ore chamber being maintained by the heat from the generator.

—L. A. C.

Hydrogen/nitrogen mixture; Manufacture of a — E. B. Maxted and G. R. Ridsdale, Walsall. Eng. Pat. 124,824, 27.4.16. (Appl. 6026/16.)

COMMERCIAL water-gas is freed from carbon dioxide, moisture, and other less volatile impurities by

suitable means, and is then cooled to about -195°C . During the earlier stages of the cooling the last traces of moisture etc. separate out and are removed; on cooling below -190°C . a considerable proportion of the carbon monoxide is also removed as liquid. The residual gas is then passed into a separating column in which it is subjected to the action of a descending stream of liquid nitrogen which liquefies the last traces of carbon monoxide. The liquid carbon monoxide collects at the bottom of the apparatus and a mixture of pure hydrogen and nitrogen issues from the top. The process is applicable to the separation of hydrogen from other gases, e.g., methane.—L. A. C.

Nitrogen from air; Process for obtaining —.
N. C. Tommasi, Basle, Assignor to Usines Electriques de la Lonza, Gampel, Switzerland. U.S. Pat. 1,295,685, 25.2.19. Appl., 15.6.17.
SEE Ger. Pat. 302,671 of 1916; this J., 1918, 335 A.

Tank for transporting acid. Eng. Pat. 124,997.
See I.

Copper or nickel sulphates. Eng. Pat. 116,263.
See X.

Removing nitrous and nitric acids from sulphuric acid. Eng. Pat. 17,541. See XXII.

VIII.—GLASS; CERAMICS.

Selenium and its applications. Anceel. See VII.

PATENTS.

Furnaces for glass manufacture and like purposes.
T. B. Kitson, Leeds. Eng. Pat. 124,273, 20.3.18. (Appl. 4922/18.)

A GLASS furnace is connected to one or more auxiliary furnaces each heated by separate gas burners supplied with air which is preheated by passing it through a flue above the auxiliary furnace or through a regenerator connected to the main furnace. Each auxiliary furnace has one or more gathering troughs which are heated by passing the waste gases from the auxiliary furnaces over the outflowing glass so as to keep it properly fluid. By this means, the working of the main furnace is largely independent of the auxiliary furnaces provided that sufficient glass is supplied to the latter. The temperature of the glass in each trough can be independently regulated.—A. B. S.

Glass-melting furnaces. H. C. Ghijsen, and Naami. Vennoots. The Vitrite Works, Middelburg, Holland. Eng. Pat. 124,807, 9.4.18. (Appl. 6057/18.)

A GLASS-MELTING furnace has a melting chamber with an inclined floor, the lower end of the floor being less steeply inclined than the upper portion; the roof of the chamber is also inclined and is stepped internally and provided near its lower end with gas-burners for melting the lower part of the charge. The molten glass is discharged continuously and portions are cut off at equal intervals of time by a pair of blades operated by suitable gearing.

—A. B. S.

Glass furnace. W. Westbury, Assignor to L. S. Skelton, Okmulgee, Okla. U.S. Pat. 1,294,581, 18.2.19. Appl., 26.6.17.

THE forehearth of a glass-drawing furnace is provided with a drawing opening in its top wall and

with a "conductor" embedded in the top wall and extending around the rear and sides of the drawing opening, the ends of the "conductor" projecting outwards at the front of the forehearth.—A. B. S.

Glass. H. P. Gage, Corning, N.Y., Assignor to Corning Glass Works. U.S. Pats. (A) 1,295,298 and (B) 1,295,299, 25.2.19. Appl., 21.7.16.

A GLASS for use as a filter to produce daylight effects from artificial light sources consists of (A) a potash borosilicate glass containing copper and nickel and free from soda or (B) a potash or potash-lead glass containing copper, cobalt, and manganese.

—A. B. S.

Glass cylinders; Methods of drawing hollow —.
W. L. Monro, Assignor to Window Glass Machine Co., Pittsburgh, Pa. U.S. Pat. 1,295,348, 25.2.19. Appl., 24.7.15.

A HOLLOW bait, slightly cooler than the molten glass and having an internal grooved flange the inner wall of which is at an angle of at least 45° , is immersed in, and then held in or adjacent to, the molten glass sufficiently long for the glass to enter the groove and solidify therein, to form a hooked portion by means of which the glass can be withdrawn on raising the bait.—A. B. S.

Glass-annealing furnace. B. F. Morton, Hoboken, Pa. U.S. Pat. 1,295,564, 25.2.19. Appl., 13.9.18.

A GLASS-ANNEALING furnace has a combustion chamber with several upper and lower arches and a muffle supported on the arches.—A. B. S.

Agglomerates of various materials [electrodes etc.]; Manufacture and utilisation of —. T. Rouse, Stamford Hill. Eng. Pat. 124,262, 18.3.18. (Appl. 4776/18.)

THE materials which are to form the electrodes or other agglomerates are mixed in a finely divided condition with from 4 to 7% of ferro boro silicate as described in Eng. Pat. 21,563 of 1910 (this J., 1911, 956). The mixture is treated with steam until it becomes plastic and is then moulded into suitable shapes. The moulded articles are subsequently submitted to a baking treatment at 600° – 800°C . to render them hard and resistant to moisture.

—W. H. C.

Kilns [for refractory materials]. W. Donald, Glasgow. Eng. Pat. 124,909, 12.4.18. (Appl. 6233/18.)

A GAS-FIRED kiln of the continuous chamber type for burning magnesite bricks and other highly refractory goods has chambers arranged in two parallel rows with two main waste gas flues between them, one for each row of chambers. A mixture of gas and preheated air is introduced along either side of each chamber at as many points as there are flues connecting the successive chambers, so that each chamber is heated from both sides simultaneously. The general character of the heating in each chamber is "down-draught," the flames rising up each side of the chamber, passing downwards and through the perforated floor into a connecting flue beneath and into the "bags" of the succeeding chamber or into one of the main flues and thence to the chimney. The air for combustion is blown through a pipe placed longitudinally in the main waste gas flue, then into the flues under the floors of the chambers and up into the "bags" of the chamber where it is required. Alternatively, air may be blown through the coolest unopened chamber and thence through succeeding chambers until it reaches the one which is being fired.—A. B. S.

Kiln. H. Webster, Clinton township, Ohio, Assignor to Wester and Kincaid, Cincinnati, Ohio. U.S. Pat. 1,295,650, 25.2.19. Appl., 24.2.17.

A BRICK kiln of the continuous chamber type has a central main flue between the two series of chambers and valve-controlled branches from this flue to the sole of each chamber. The soles are provided with intersecting longitudinal and transverse grooves, which act as fuel-troughs, and with openings into the branch flues. The fuel is supplied through feed-holes in the top of each chamber.

—A. B. S.

IX.—BUILDING MATERIALS.

Dolomite limestone; Decarbonation of — in the rotary kiln. E. E. Bakins. J. Ind. Eng. Chem., 1919, 11, 340.

IN a rotary kiln, 150 ft. long and 6½ ft. diameter inside the lining, and making one rotation in 1 min. 40 secs., the first decomposition took place about 100 ft. from the discharge end; this decomposition was entirely that of magnesium carbonate and increased gradually up to a point 30 to 40 ft. from the discharge. At this point, calcium carbonate commenced to decompose, giving free lime. The production of calcium oxide took place entirely in the last 30 or 40 ft. of the kiln and was not complete until the last 10 ft. had been reached. It was not possible to measure the temperature inside the kiln, but the gas at the port just before it entered the kiln had a temperature of 1500°—1600° F. (about 820° to 870° C.) whilst the flue gases varied from 1100° to 1300° F. (about 590° to 700° C.).—W. P. S.

Leaching cement mill flue dust. Anderson. See VII.

PATENTS.

Kilns. J. P. Scheffers and M. A. Van Roggen, Paris. Eng. Pat. 115,232, 16.4.18. (Appl. 6444/18.) Int. Conv., 26.4.17.

A VERTICAL kiln of the continuous type, for burning limestone, cement, gypsum, etc., is narrow and rectangular in horizontal cross section and is provided at the top with a loading chamber also rectangular in cross section and flaring upwards from the upper edge of the burning chamber. The walls of the burning chamber are provided with side openings and burners are placed in the upper openings. Two such kilns may be arranged side by side in a setting so that between and adjacent to the outer sides of the burning chambers, air chambers containing the supply pipes for the burners are formed. Cooling air may be supplied from these chambers through the lower side openings to cool the material as it passes downwards from the burning zone to the discharge opening. The heated air in the air chambers passes upwards through conduits in the dividing walls of the loading chambers, and is discharged into an annular space at the top which is provided with an inclined perforated wall through which the hot air passes into and then through the material in a storage chamber above the kilns.

—W. F. F.

Mineral [slag] wool; Manufacture of —. G. A. Herdman, Redcar. Eng. Pat. 124,050, 26.6.18. (Appl. 10,538/18.)

AN apparatus for making mineral wool comprises a modified Willow or Teaser machine in which a drum provided with prongs revolves in a casing also provided with prongs on part of its inner surface and with an opening at the bottom. The slag wool passes between the drum and casing and falls on to a vibrating screen which separates the

“shot” or slag pellets. Alternatively, the wool is passed through an inclined rotating cylinder of wire gauze or perforated metal, provided with baffles and a sufficient number of prongs to carry the wool round whilst the cylinder rotates very slowly and to allow it to drop when it reaches the highest point in its path. The material is discharged from the cylinder on to a vibrating screen as before. Owing to the more complete separation of the slag pellets, the product is much lighter than ordinary mineral wool without having lost any of its characteristic properties.—A. B. S.

Pavement, road-making and the like materials; Waterproofing —. J. Baker, jun., Chicago, Ill., U.S.A. Eng. Pat. 124,851, 7.12.17. (Appl. 18,171/17.)

MATERIALS for pavements, roads, etc., are thoroughly saturated with a waterproofing agent which is also a binder, the mass being heated *in vacuo* during the mixing operation until the moisture has been expelled, after which steam under pressure is introduced until the waterproofing agent such as bitumen, paraffin, tar, or tar products has permeated the materials to the desired extent. The product is more durable than when only the surface has been made waterproof.—A. B. S.

Wood; Process of treating —. C. H. Teesdale, Madison, Wis. U.S. Pat. 1,295,828, 25.2.19. Appl., 20.1.17.

WOOD is preserved by saturating it with a fluid preservative and removing the latter from the exterior of the wood by means of heat and partial vacuum.—A. B. S.

Lime-sand bricks; Manufacture of mixtures for —. C. F. Neumann, Geesthacht. Ger. Pat. 309,708, 6.11.17.

GROUND lime is mixed mechanically with a portion of the sand and with water; the mixture is transferred to an open vessel or a slowly moving conveyor in which the slaking of the lime is completed, after which the remainder of the sand is added and the product mixed thoroughly. It is claimed that less lime is required by this method of mixing.

—A. B. S.

Mixing concrete etc. Eng. Pat. 124,961. See I.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Coal washing; Advantages of efficient — as reflected in the manufacture of iron and steel. W. H. Graham. Trans. Canadian Min. Inst., 1918, 21, 231—239.

BY the use of coal in which the proportions of pyrites, shale, etc. have been reduced to fairly low and definite limits by efficient washing, coke of uniform sulphur and ash content is obtained, and the capacity of coke-oven plant is increased by reason of the greater gas value per unit of coal charged. In the iron blast-furnace, better results are obtained with such coke than with coke produced from raw coal; less lime is required for fluxing, the quality of the pig is better and more uniform as regards silicon and sulphur contents, and a greater output is obtained by reason of the higher calorific value of the fuel. In the open-hearth furnace, the time necessary to finish the steel is determined to a large extent by the quality and uniformity of the pig charged.—W. E. F. F.

"Nieu" steel and its manufacture. G. M. Colvocoresses. Trans. Canadian Min. Inst., 1918, 21, 48—75.

HITHERTO, Sudbury ore, containing (average for 1916) Ni 3.25, Cu 1.7, Fe 40, S 25, SiO₂ 20, Al₂O₃, CaO and MgO 10%, has been treated mainly as a nickel-copper ore, with the result that the whole iron content has been wasted, while only about 80% of the nickel and 83% of the copper have been recovered. Most of the nickel obtained has been subsequently recombined with iron for the production of nickel steel. In the "Nieu" process the ore is treated as an iron ore containing nickel and copper, for the direct production of an alloy pig-iron which is subsequently refined to produce nickel-copper ("Nieu") steel. The ore, the composition of which is adjusted by proper mixing of the various grades, is crushed to about $\frac{1}{4}$ in. size and roasted, and the product (containing not more than 0.5% S) is smelted with coke and limestone. Up to the present the smelting has been conducted only in electric furnaces, but successful blast-furnace operation is anticipated. The pig produced was at first converted into steel in an electric furnace; but later an ordinary open-hearth furnace was employed, under ordinary steel-making conditions, with complete success. In a trial on weathered, low-grade ore containing Fe 46.0, Ni 1.3, Cu 0.28, SiO₂ 19.0, and S 8.0%, a pig was produced containing Ni 2.20, Cu 0.40, Mn 0.18, Si 1.75, C 3.0, S 0.09, and P 0.07%, from which a steel containing Ni 2.13, Cu 0.40, C 0.20, Mn 0.51, S 0.03, Si 0.03, and P 0.006% was produced in the open-hearth furnace. This steel practically fulfilled the conditions required by the British Government standard 2% nickel case-hardening steel as regards chemical composition and physical tests. Similar agreement was obtained in comparative tests on 3.5% nickel-copper (Nieu) steels and various commercial 3.5% nickel steels; while Nieu steel containing 2.25% Ni and 0.75% Cu was found equal in all respects to commercial nickel steels containing 3% Ni. Nieu steels in which the proportion of copper does not exceed $\frac{1}{4}$ or $\frac{1}{2}$ of the nickel present are the most satisfactory in practice, and the copper content should preferably not exceed 1% if the steel is to be used for the same purposes as the corresponding nickel steel. By the Nieu process, 98% of the nickel, 98% of the copper, and 96% of the iron in the ore are recovered. Without considering the sulphur, of which a recovery of 80% is anticipated, it is estimated that Nieu steel equivalent to 3% nickel steel could be produced at \$30.00 (£6 5s.) per ton, whereas the selling price of the latter in normal times is more than twice that figure.—W. E. F. P.

Ferro-molybdenum; Manufacture of — in Canada. J. W. Evans. Trans. Canadian Min. Inst., 1918, 21, 154—160.

SINCE March 1916, 100,000 lb. of 70% ferro-molybdenum has been produced for the Imperial Munitions Board by the direct smelting of molybdenite concentrate at the works of the Tivani Electric Steel Co., Bellville, Ont. Vertical cylindrical furnaces of the single-phase type are employed, requiring 3000—4500 amp. at 50 volts per furnace. Each consists of an iron shell, lined with red brick, firebrick, silica brick, and carbon in succession, and resting on a concrete foundation. The lower electrode consists of a water-cooled bronze or copper block from which iron rods project upwards into the furnace bottom, and the upper electrode of a graphite or carbon rod. For the production of 70% alloy from concentrate containing MoS₂ 75 and Fe 9%, the charge consists of concentrate 100, lime 120, coke 10, and scrap steel 5 lb. Each furnace is tapped every 4 hrs., the output being 1050 lb. of alloy per 24 hrs. During the two years in which the plant was operated for the production of ferro-molybdenum containing Mo 70, S 0.4, C 0.40%, the average

composition of the product was Mo 70.43, S 0.38, and C 3.56%. Details of the methods employed in the analysis of the alloy and concentrate are appended.—W. E. F. P.

Uranium; Determination of — in alloy steels and ferro-uranium. G. L. Kelley, F. B. Myers, and C. B. Illingworth. J. Ind. Eng. Chem., 1919, 11, 316—317.

Two grms. of the sample is dissolved in 75 c.c. of hydrochloric acid (1:1), the solution is oxidised with nitric acid, diluted, boiled, filtered to remove tungsten, and the filtrate evaporated and the silica and remaining traces of tungsten separated in the usual way. The solution is then evaporated to a syrupy consistence and the greater portion of the iron separated by extraction with ether. The residual liquid is diluted to 150 c.c., boiled with an excess of saturated sodium carbonate solution, and the precipitated chromium, iron, aluminium, manganese, cobalt, nickel, and copper hydroxides, together with traces of silica, titanic oxide, phosphorus and vanadium compounds are filtered off; if a large quantity of precipitate is obtained, it should be dissolved in hydrochloric acid and reprecipitated. The filtrate is acidified with sulphuric acid, boiled to expel all carbon dioxide, ammonia free from carbonate is added in slight excess, and the solution boiled. Uranium, with much of the vanadium, is precipitated; if much phosphorus is present, the precipitate should be dissolved in nitric acid, and the phosphoric acid separated by means of molybdic acid reagent. The filtrate from the ammonium phosphomolybdate precipitate is treated with a few drops of sulphuric acid and a small amount of ammonium persulphate, then rendered ammoniacal, and boiled. The precipitated uranium mixed with vanadium is transferred to a beaker, a small quantity of water is added followed by solid ammonium carbonate, the mixture is warmed, filtered, the filtrate acidified with sulphuric acid, boiled to expel carbon dioxide, treated with a slight excess of ammonia, and the precipitated uranium and vanadium collected, ignited in a platinum basin, and weighed as U₂O₅ and V₂O₅. To correct for the amount of vanadium (the quantity thus precipitated is only a small proportion of that contained in the metal), any of the usual methods for determining vanadium may be used; e.g., reduction with hydrochloric acid and titration with permanganate solution, or oxidation with ammonium persulphate and silver nitrate followed by electro-metric titration.—W. P. S.

Stellite [cobalt-chromium-tungsten alloys]; Production and uses of —. S. B. Wright. Trans. Canadian Min. Inst., 1918, 21, 272—277. (See also this J., 1915, 1058; 1917, 1238.)

STELLITE is prepared by melting cobalt, chromium, and tungsten together in electric tilting furnaces of the arc type, in which the lower electrode is in contact with the metal bath. Current at 50 volts is employed at starting; and, when the furnace is running smoothly, the voltage is increased to 100, the average ampère being about 80. The charge is poured, at about 1550° C., into graphite moulds, and the bars or shapes are first trimmed and then ground on alundum and carborundum wheels. For cutting tools the alloy is made in three grades of hardness; a special grade, which has been employed recently with marked success for boring cylinders used in aeroplanes, is to be placed on the market shortly. In addition to the above uses, for which the alloys have been found superior to high-speed tool steels, stellite is largely employed in the manufacture of automobiles, and a malleable form, of modified composition, is used for making cutlery, surgical instruments, and similar articles.—W. E. F. P.

Metallurgical furnaces; Heating of — L. Lecocq. *Chim. et Ind.*, 1919, 2, 260—270.

COMPARATIVE experiments have been made on the use of (a) mixed gas (producer gas) and (b) coke-oven gas for firing metallurgical reheating furnaces, the experimental furnace used being an iron and steel reheating furnace of the simple recuperative type. It is shown by means of thermal balance sheets and cost calculations that the use of coke-oven gas offers considerable advantages both to the metallurgist and the coke manufacturer.—E. H. R.

Reduction of oxides by carbon; Equilibria in the — R. E. Slade and G. I. Higson. *Chem. Soc. Trans.*, 1919, 115, 205—214.

A SMALL quantity of a metal was heated in a vacuum to a suitable temperature and carbon monoxide was admitted until the equilibrium pressure was exceeded, when the gas entered into reaction with the metal forming carbon and the metallic oxide until the equilibrium pressure was attained; some of the carbon monoxide was then removed, when the reverse action occurred until the equilibrium pressure was restored. If the carbon liberated in the first stage separated as an independent phase the final pressure would be the same in both cases, but if it formed a carbide or a solid solution with the metal, the system would possess two degrees of freedom and the two equilibrium pressures would be of different magnitude. In order to avoid complications arising from the balanced action between carbon monoxide and carbon dioxide it was necessary to have an appreciable equilibrium pressure, but not greater than 50 mm., at 850° C. From thermodynamic considerations elements satisfying these conditions must have a heat of oxidation between 75,000 and 114,000 calories, and the only elements of which the heat of oxidation lies definitely within this range are silicon, boron, and manganese, whilst vanadium, tantalum, and chromium might also meet the requirements. For vanadium and carbon monoxide the equilibrium pressure was approximately 1.45 mm. at 1340° C., whether the equilibrium was attained from a pressure above or below. With tantalum the equilibrium pressure was only 0.1 mm. even at 1270° C. With chromium a definite equilibrium pressure was observed at each temperature, the value 9.2 mm. being recorded at 1339° C., whereas at 1292° C. two different values, viz. 4.4 and 6.2, were obtained according to whether the reagents had previously been heated to 1339° C. or not; this behaviour must be due to the substances in equilibrium being different in the two cases, the metal, indeed, probably being converted into a new form between 1292° and 1339° C. and retaining its new form after cooling. The apparatus used has already been described (Slade, this J., 1913, 31).—D. F. T.

PATENTS.

Copper or nickel; Production of sulphates of — from ores and minerals. F. Rigaud, Paris. Eng. Pat. 116,263, 18.3.18. (Appl. 4774/18.) Int. Conv., 12.5.17.

COPPER- or nickel-bearing minerals are made to pass, manually or mechanically, along a trough composed of several successive portions, some horizontal and some differently inclined, so as to admit of a slow flow of liquid and methodical lixiviation and draining. The mineral travels in a direction opposed to the flow of liquid, which contains sulphuric acid produced by the interaction of sulphur dioxide, steam, and air in presence of a portion of the solution obtained by lixiviation of the

mineral, in a coil pipe. The solution containing copper or nickel sulphate is delivered to a heap of faggots arranged above an evaporating pan and flows into the evaporating pan and then into a crystallising pan.—T. H. B.

Brass; Recovery of — from foundry ash and the like. C. H. White, Coventry. Eng. Pat. 124,019, 14.2.18. (Appl. 2653/18.)

THE residual ash left after pouring molten brass from crucibles is heated to 1050°—1250° C., and stirred. The metallic globules agglomerate and may be collected. A flux may be employed, if desired, to form a fusible slag on the surface to prevent oxidation.—C. A. K.

Metals [readily oxidisable]; Treatment of — The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 125,046, 2.1.19. (Appl. 113/19.)

A READILY oxidisable metal (iron, copper, and the like) is heated under non-oxidising conditions in contact with aluminium powder to cause the aluminium to alloy with the metal at the surface. The metal is then heated further, e.g., for about 6 hours at 1000° C., to cause the aluminium to diffuse throughout the metal, and afterwards again heated under non-oxidising conditions, in presence of aluminium powder, to cause a concentration of aluminium alloy at the surface.—T. H. B.

Rustproofing; Zinc-vapour — D. Dapontè and T. F. Newman, London. Eng. Pat. 124,283, 21.3.18. (Appl. 5023/18.)

IRON or steel articles are coated with copper by a galvanoplastic process or by dipping in a suitable bath and are then subjected to a zinc vapour rust-proofing process.—T. H. B.

Galvanising; Dry — D. R. Ward, Assignor to The Ward Nail Co., Struthers, Ohio. U.S. Pat. 1,294,001, 11.2.19. Appl., 25.5.17.

ARTICLES are placed in a mixture of not more than 25% of finely divided graphite and 75% of pulverulent zinc, and heated in a closed container.

—C. A. K.

Zinc; Manufacture of — C. W. Crocker, Irvine. Eng. Pat. 124,621, 4.5.18. (Appl. 7505/18.)

ABOUT 1.5% of sodium carbonate (soda ash) is introduced as a flux into the charge in zinc distillation furnaces, in place of the sodium chloride commonly used. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 22,361 of 1896, 16,388 of 1898, and 10,915 of 1900; this J., 1897, 1021; 1899, 770; 1901, 724).—T. H. B.

Zinc; Reverberatory furnaces for use in the recovery of — from dross. J. Wilkes and H. E. Harris, Stockton-on-Tees. Eng. Pat. 124,978, 26.6.18. (Appl. 10,553/18.)

THE furnace has two fire-grates, the flame from one playing over the dross and the flame from the other playing on the metal which flows from the dross.—T. H. B.

Ores; Furnaces for roasting — R. Martin and J. I. Richards, Swansea. Eng. Pat. 124,540, 21.1.18. (Appl. 1174/18.)

IN a furnace for roasting ore, more particularly zinc ore, rabble-bars are arranged in groups, the blades of one group only being operative during

one stroke, and the blades of the other group during the succeeding stroke. The blades are of triangular form, obliquely set to the floor or shelf of the furnace, and the groups of rabble-bars are respectively attached to two slides having relatively opposed vertical movements, the slides being carried on a frame which is reciprocated to and fro horizontally, and suspended by links from a centrally pivoted cross-head. The swinging movement of the centrally pivoted cross-head takes place against the pressure of a buffer-like yielding device so that the slides may be set or locked in their adjusted positions.—T. H. B.

Tin; Process for melting — and apparatus for use therein. G. H. Forrester, Iver, Bucks. Eng. Pat. 124,594, 3.4.18. (Appl. 5696/18.)

TIN, particularly that obtained from de-tinning processes, is fed into a vessel containing grease heated to the melting point of tin, in a vessel the lower portion of which is smaller than the upper portion and extends into a furnace the heat of which is prevented from acting directly upon the sides of the upper portion of the vessel.

—T. H. B.

Aluminium alloy. H. C. Hall, and Rolls-Royce, Ltd., Derby. Eng. Pat. 124,683, 28.10.18. (Appl. 17,579/18.)

AN alloy especially suitable for pistons of internal combustion engines consists of aluminium 91% or more, copper 4.5–6%, nickel 0.5–0.8%, zinc 0.8–1.2%, antimony 0.7–1.0%. The aluminium is of ordinary commercial purity containing, for instance, from 0.5%–0.9% of iron, and preferably less than 0.1% each of manganese, magnesium, and tin.—T. H. B.

Alloy. B. Hauss, Administratrix of D. J. Hauss, Aurora, Ind., Assignor to F. W. Galbraith. U.S. Pat. 1,293,426, 4.2.19. Appl., 26.6.16.

AN alloy composed of aluminium 72 parts, zinc 24 to 25 parts, and copper 3 parts, and practically free from the oxides of these metals.—W. F. F.

Tungsten and similar metals; Process of extracting — from their ores. D. J. and J. E. Giles, McKeesport, Pa. U.S. Pats. (A) 1,293,402, (B) 1,293,403, and (C) 1,293,404, 4.2.19. Appls., (A), (B) 11.2.18., (C) 15.3.18.

(A) TUNGSTEN ores are heated with a solution of sodium hydroxide with the formation of soluble sodium tungstate. A calcium salt is added to the clear solution at a fairly high temperature and calcium tungstate is precipitated and recovered. (B) The sodium tungstate solution is diluted, cooled, treated with a calcium compound to precipitate insoluble compounds of calcium, silica, and phosphorus, and after removing the precipitate calcium tungstate is precipitated by a further addition of the calcium salt to the heated solution. (C) After the removal of the calcium compounds of silica and phosphorus, an insoluble acid compound of the metal may be precipitated by the addition of an acid to the residual liquor.—C. A. K.

Precious metals [platinum]; Recovery of —. R. E. Lyons, Bloomington, Ind. U.S. Pat. 1,293,823, 11.2.19. Appl., 20.3.13.

PLATINUM amalgam is obtained from platiniferous material associated with gangue by bringing the material into contact with mercury, zinc, and a substance capable of attacking zinc in the presence of the other materials.—C. A. K.

Solid castings; Process for producing —. J. B. Walker, Birmingham, Ala. U.S. Pat. 1,294,209, 11.2.19. Appl., 22.1.18.

A VENT pipe is introduced into the head of the molten ingot or casting. The lower end of the pipe is of fusible metal and is filled with thermit and fluxing material, so as to increase the fluidity of the molten core of the ingot. Occluded gases are allowed to escape through the upper part of the pipe, which remains frozen in the ingot.

—C. A. K.

Metallic oxides; Process of treating —. J. W. Moffat, Toronto, Canada. U.S. Pat. 1,294,514, 18.2.19. Appl., 30.4.18.

OXIDE ore is reduced without fusion and oxidising gases are excluded from the reduced material while its temperature would permit re-oxidation. The reduced charge is then placed in a separate electric furnace and fused in an inert or reducing atmosphere.—T. H. B.

Metals; Refining of —. J. B. Murray, Brooklyn, N.Y. U.S. Pat. 1,295,568, 25.2.19. Appl., 3.8.18.

THE metal is heated to a welding temperature, under pressure, and the source of heat is then removed, but the pressure is maintained until after the metal has cooled below its critical temperature of structural change.—T. H. B.

Metal dust; Apparatus for manufacturing —. M. H. Newell, Assignor to The Alloys Co., San Francisco, Cal. U.S. Pat. 1,295,573, 25.2.19. Appl., 6.8.18.

THE metal is vaporised in a retort attached to a condensing chamber; a hood forming part of the condensing chamber surrounds the mouth of the retort, the upper wall of the hood being spaced from the mouth of the retort so as to permit the vapour to cool before coming into contact with it.

—T. H. B.

Ore materials; Process for separating — from each other. R. S. Towne, New York, and F. B. Flinn, Orange, N.J., Assignors to Rubble-Column Corporation. U.S. Pat. 1,295,817, 25.2.19. Appl. 5.2.13. Renewed 20.11.18.

A VESSEL is charged with a pulp consisting of crushed ore, water, and a froth-producing and mineral-selecting agent, and a gas is introduced through a fine-texture porous medium into the pulp; certain mineral particles adhere to the bubbles rising through the pulp, and form a column above the pulp, the mineral thus floated being separated at the upper part of the column.—T. H. B.

Metallurgical furnaces; Roofs for —. P. J. Griffin, Toronto, Canada. Eng. Pat. 124,125, 17.6.18. (Appl. 9962/18.)

Tin and terne plates and other like metal-coated plates or sheets; Manufacture of — and machinery to be employed in said manufacture. H. S. Thomas, Llandaff, W. R. Davies, Whitchurch, and R. B. Thomas, London. U.S. Pat. 1,294,970, 18.2.19. Appl., 13.5.18.

SEE Eng. Pat. 28,450 of 1913; this J., 1915, 89.

Zinc; Extraction of —. H. L. Sulman and H. F. K. Picard, Assignors to The Metals Extraction Corporation, Ltd., London. U.S. Pat. 1,295,080, 18.2.19. Appl., 20.1.17.

SEE Eng. Pat. 104,697 of 1916; this J., 1917, 508.

XI.—ELECTRO-CHEMISTRY.

Electrical precipitation of tar fog. Davidson.
See IIA.

Selenium and its applications. Ancel. See VII.

PATENTS.

Electric-arc furnace. I. Rennerfelt, Djursholm, Sweden. U.S. Pat. 1,294,830, 18.2.19. Appl., 24.8.16.

See Eng. Pat. 101,412 of 1916; this J., 1917, 1016.

Gas reactions. U.S. Pat. 1,291,745. See I.

Agglomerates [electrodes]. Eng. Pat. 124,262.
See VIII.

XII.—FATS; OILS; WAXES.

Oil-bearing seeds; [Proteolytic] enzymes of —.
O. Fernández. Anal. Fis. Quím., 1918, 16, 728—741.

The amino-acids formed by the autolysis of the macerated seeds in water at 37° C. were determined by measuring the nitrogen evolved on treating the solution with a solution of nitrosyl chloride in sodium chloride. By this method the existence of proteolytic enzymes in poppy, almond, filbert, peanut, hemp, walnut, pine kernel, and castor seeds was indicated. An alternative method was also applied. The macerated seed was mixed with water and toluene and the acidity of a portion determined by titration with N/20 barium hydroxide. To an equal volume of the extract formaldehyde was added, and after a time the acidity was again determined. The difference in the acidity is due to the amino-acid present. Enzyme action was especially marked in the case of poppy seeds.—W. S. M.

Fatty acids from lignite tar oil. Harries. See III.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Coumarone resins; Technical —. J. Marcussön.
Chem.-Zeit., 1919, 43, 109—111, 122—123. (See this J., 1919, 285 A.)

COUMARONE resins dissolve completely or almost completely in acetone, whereas coal tar pitch, lignite pitch, wood tar pitch, and petroleum pitch are only sparingly soluble. They may be distinguished from phenol-aldehyde resins by their ready solubility in petroleum spirit, and by not yielding phenol when heated with soda-lime. Natural resins, such as colophony, sandarac, etc., melt at a higher temperature than coumarone resins, and have much higher acid, saponification, and iodine values, besides being optically active, whereas coumarone resins are optically inactive. The consistency is determined by determining the time in seconds taken by a wire nail 130 mm. long and 23 to 24 grms. in weight to sink vertically from the point to the head in the resin at 20° C. A resin which softens below 30° C. is classified as "soft" when the nail takes at least 500 secs. to penetrate the mass, and as "viscid" when the time is at least 100 secs. When the latter value

is not reached the resin is classified as "fluid." Products which when distilled in a current of steam yield less than 35% of coumarone resin are termed coumarone resin residues. Distillation is necessary whenever the nail test gives 5 secs. or less. Free sulphuric and sulphonic acids are determined by Wolff's method (Farben-Zeit., 1917, 919), in which 10 to 20 grms. of the resin is dissolved in neutral benzene or xylene, the solution repeatedly extracted with warm water, and the aqueous extract filtered, acidified, and treated with barium chloride. The resinous constituents may be fractionated by successive treatment of the sample with alcohol-ether and with acetone. Three grms. of the resin is dissolved in 15 c.c. of ether, and the solution treated, drop by drop, with 45 c.c. of 96% alcohol. After being chilled for 30 mins. with ice-water the liquid is filtered, the precipitate washed with 15 c.c. of chilled 96% alcohol, the filtrate evaporated, and the residue weighed. The precipitate which contains the resinous constituents insoluble in alcohol and any asphaltic substances present is dried at a low temperature, and treated with acetone. The solution on evaporation leaves the resin, whilst the asphaltic substances are dissolved off the filter by means of chloroform or benzene, the solution evaporated, and the residue weighed. In the samples examined the amount of substances insoluble in acetone varied from 3.6 to 16.3%. With the exception of one abnormal sample, the amount of resins soluble in acetone but insoluble in ether-alcohol was 52 to 53% in the case of very hard resins, 42 to 44% in hard resins, 32 to 34% in resins of medium hardness, 15 to 30% in soft resins, and 5 to 7% in fluid resins. The method thus affords a means of confirming the tests of consistency and softness. Treatment of a solution of 5 grms. of coumarone resin in 50 c.c. of carbon tetrachloride with 3 c.c. of strong sulphuric acid effects a partial separation of oily and asphaltic substances from resinous constituents, but the unattacked portions are often still soft and viscid. Hence coumarone resins may contain two kinds of oil, one of which is readily attacked by sulphuric acid, whilst the other is resistant. Three modifications of polymerised indene may be present in coumarone resins, the first of which (m.pt. 210° C.) is sparingly soluble in ether, the second, melting at about 165° C., being readily soluble in ether, but sparingly soluble in ether-alcohol, whilst the third (m.pt. below 100° C.) is readily soluble in ether-alcohol. It is to the presence of this last modification and of other by-products that the relatively low melting-point (not above 65° C.) of technical coumarone resins is due. Of the oily constituents, the presence of styrol condensation products tends to make the product viscous. To improve the manufacture of coumarone resins and obtain a more uniform product a first essential is to remove as completely as possible the resin acids formed by the action of sulphuric acid on the tar distillate. An accumulation of oily substances in the coumarone resin may be prevented, if only that fraction of solvent naphtha boiling between 160° and 180° C. which contains coumarone and indene is used, and if the constituents which do not react with sulphuric acid are removed completely by treatment with steam, if necessary with the aid of reduced pressure. To avoid the formation of the modification of polymerised indene melting below 100° C., the polymerisation of the coumarone and indene may be effected by means of metallic salts instead of, as at present, by means of sulphuric acid. In this way light-coloured coumarone resins melting at 160° C. can be obtained.—C. A. M.

Resinous substances. Paul. See IV.

PATENTS.

Paint. J. C. Benneche, Christiania, Norway. Eng. Pat. 124,046, 13.3.18. (Appl. 4458/18.)

A PAINT which is water- and oil-proof, and resistant to high temperatures (*e.g.*, 180° C.) is prepared as follows. Four preliminary mixtures are prepared:—(1) 16 kilos. of resin dissolved in 10 litres of boiled linseed oil; (2) 75 kilos. of dry colour (not white lead) with linseed oil and petroleum to form a paste; (3) 5 kilos. of lime slaked with water to a paste; (4) 10 kilos. of yellow soap dissolved in boiling water and cooled so as to form a jelly. Nos. (2) and (3) are mixed with part of the remainder of an original quantity of 40 litres of boiled linseed oil and 40 litres of petroleum, mixture (4) is added, then the remainder of the linseed oil and petroleum, and finally, in turn, mixture (1) and 5 litres of terebine.—E. W. L.

Zinc oxide; Preparing pigment —. L. E. Wemple, St. Louis, Mo., Assignor to American Zinc, Lead and Smelting Co., Boston, Mass. U.S. Pat. 1,292,976, 28.1.19. Appl., 9.1.18.

CRUDE zinc oxide, containing excess of zinc sulphate, together with lead or cadmium as sulphate and not appreciably as oxide, is prepared by treating zinc-bearing materials in the presence of sulphur, and the excess of zinc sulphate is then eliminated by treatment with a combining agent which converts it into insoluble zinc compounds, whilst remaining, under the conditions, inert towards lead or cadmium.—E. W. L.

Ore [yellow ochre] roasting furnace. Method of making paint-bodies. E. T. Goldthorpe, Assignor to F. von Nessen and W. H. Dicks, Chicago, Ill. U.S. Pats. (A) 1,295,729 and (B) 1,295,730, 25.2.19. Appl., (A) 17.7.16 and (B) 28.1.18.

A FURNACE, for roasting and agitating yellow ochre in a limited supply of air, consists of a grate above which is an inclined track. The ore is charged into cylindrical containers which are adapted to roll down the track; near the lower end of the track is a removable stop adapted to intercept the container next to the lowermost one, whilst the latter passes through a discharge door on to a tilting support and discharges its contents into a closed cooling chamber from which the material is finally discharged.

—W. E. F. P.

Resins; Manufacture of synthetic —. R. E. Dior, Boulogne sur Seine, France. Eng. Pat. 124,010, 10.1.19. (Appl. 2272/18.)

IN the preparation of synthetic resins by the condensation of phenols with aldehydes, the catalyst employed is the ammonium salt of a volatile organic acid, or of an organic acid which can be decomposed to form phenol or cresols, or ammonium bicarbonate. The process may be carried out in the following manner. Formaldehyde (40%), 3 galls., is added to commercial carboic acid, 5.5 galls., and ammonium bicarbonate, 6 lb., in a steam-jacketed digester provided with a reflux condenser. The reaction begins in the cold and is completed by heating to 50°–100° C., in about 1–1 hr. The apparatus is then cooled by passing water through the jacket. The upper aqueous layer is decanted, the condensation product left for 2–3 hrs., and the water which separates removed. The product is heated *in vacuo* or at normal pressure to 110°–120° C., until all traces of water and catalyst are removed. Other phenols, cresols, or aldehydes may be used, and other substances incorporated, *e.g.*, fatty acids (stearic) and their salts, waxes, crude or vulcanised rubber. Lime, baryta, or magnesia may be added during the third stage to assist removal of the catalyst.—E. W. L.

Resin size; Process for making —. J. A. De Cew, Montreal, Canada. U.S. Pat. 1,292,721, 28.1.19. Appl., 21.2.14. Renewed 20.6.18.

ROSIN soap is heated in a closed vessel and forced by pressure applied to the interior of the vessel through a perforated screen, whilst a current of hot water is directed against the perforations in the screen in a direction substantially opposite to the flow of the rosin soap.—C. A. M.

Turpentine still. G. Burton, Duncanville, Ala. U.S. Pat. 1,293,027, 4.2.19. Appl., 17.11.17.

THE distillate from a turpentine still passes into a container and the distillate from the container passes to a second container through an ascending pipe connecting the lower end of the first to the upper portion of the second container. When water alone passes into the second container it is automatically discharged through a normally open discharge, but when turpentine is received therein means are operated by which a normally closed valve-controlled discharge opening is opened to permit discharge of the turpentine.—E. W. L.

Drier. A. Schwarcman, Assignor to S. Kellogg, S. Kellogg, jun., and H. Kellogg, Buffalo, N.Y. U.S. Pat. 1,291,185, 14.1.19. Appl., 2.5.10. Renewed 5.10.17.

A MIXTURE of about 1000 parts of oil, 50 of black manganese oxide, 50 of lead oxide, and 500 of water is agitated and heated to 250°–320° F. (127°–160° C.) at a pressure of 150–175 lb.

Drier and process of making the same. A. Schwarcman, Buffalo, N.Y. U.S. Pat. 1,291,186, 14.1.19. Appl., 24.2.11. Renewed 13.10.17.

FATTY acids are heated to a temperature below their boiling point, and then treated successively with a solution of less than their chemical equivalent of a metallic salt, and with caustic alkali.—E. W. L.

Japan; Process for making and applying —. W. P. Davey, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,294,627, 18.2.19. Appl., 18.8.17.

SEE Eng. Pat. 121,533 of 1918; this J., 1919, 81 A.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Mechanical coagulation of —. G. J. Zuyderhoff, Indische Mercuur, 1918, 61, 620–621. Bull. Agric. Intell., 1918, 9, 1494.

A CURRENT of air is passed over the surface of the warm latex, the temperature of which is raised either by applying heat at the bottom of the containing vessel or by preheating the air. In order to avoid the formation of a skin which would prevent the action of the air on the deeper layers of latex, the mass is kept stirred, *e.g.*, by rocking the containing vessel. The crêpe obtained from the final coagulum has a light colour and in quality appears comparable with rubber prepared by the customary process of coagulation with acetic acid.

—D. F. T.

Selenium and its applications. Ancel. See VII.

PATENTS.

Vulcanisation of rubber and similar materials. Dunlop Rubber Co., Ltd., London, and D. F. Twiss, Sutton Coldfield. Eng. Pat. 124,276, 20.3.18. (Appl. 4944/18.)

By adding a relatively small quantity of a solution of sodium or potassium in an aromatic amine such

as aniline to a rubber mixing, the rate of vulcanisation can be increased to a much greater extent than by the use of the aromatic amine alone, the result probably being due to the formation of the hydroxide of the alkali metal in a uniformly dispersed condition throughout the mass.—D. F. T.

Vulcanising rubber articles; Process of —. R. B. Price, Mishawaka, Ind., Assignor to Rubber Regenerating Co. U.S. Pat. 1,295,594, 25.2.19. Appl., 19.6.11.

ARTICLES composed of layers of rubber and fabric built up on a form, are provided with an impervious coating on their exterior surface and are then subjected to a reduced pressure for the purpose of removing the air enclosed between the layers; they are then vulcanised.—D. F. T.

Rubber composition; Adhesive —. E. M. Slocum, Medan, Sumatra, Assignor to General Rubber Co. U.S. Pat. 1,293,957, 11.2.19. Appl., 8.1.17.

A NON-DRYING oil which assumes a gummy condition when exposed, e.g., castor-oil, is dissolved in a volatile solvent with rubber-containing latex, and the mass is coagulated.—E. W. L.

Caoutchouc; Producing substances resembling —. H. S. A. Holt and G. Steimmig, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,294,662, 18.2.19. Appl., 22.8.12.

SEE Fr. Pat. 440,173 of 1912; this J., 1912, 735.

XV.—LEATHER; BONE; HORN; GLUE.

Gelatin; Determination of copper and zinc in —. G. S. Jamieson. J. Ind. Eng. Chem., 1919, 11, 323—325.

FROM 20 to 50 grms. of the sample is digested with 100 c.c. of water and 15 to 30 c.c. of hydrochloric acid for 2 hrs. on a water-bath, then cooled to 40° C., rendered slightly ammoniacal, and treated with hydrogen sulphide. In the case of high-grade gelatins, a few mgrms. of ferrous sulphate should be added before the addition of ammonia. The precipitated sulphides are collected, washed with very dilute ammonium sulphide solution, dissolved in hot dilute nitric acid, and the solution evaporated with sulphuric acid to expel the nitric acid. The residual acid solution is diluted to 30 c.c., heated to 50° C., treated with hydrogen sulphide, the copper sulphide collected, washed with hot water saturated with hydrogen sulphide, ignited to oxide, and weighed. The filtrate containing the zinc is rendered ammoniacal, 15 c.c. of 50% formic acid is added, and the solution is treated with hydrogen sulphide; the zinc sulphide formed is collected, washed with 2% ammonium thiocyanate solution, dried, ignited to oxide, and weighed.—W. P. S.

Amphoterie colloids [gelatin]; Volumetric analysis of ion-protein compounds: the significance of the isoelectric point for the purification of —. *Amphoterie colloids. II.* J. Loeb. J. Gen. Physiol., 1918, 1, 237—254.

THE influence of univalent ions such as Ag, Br, and CNS on the swelling, osmotic pressure, and viscosity of gelatin is determined by chemical or stoichiometrical and not by "colloidal" properties. Gelatin is practically undissociated at its isoelectric point. On the alkaline side of this point it can combine only with cations and on the acid side it can combine only with anions. (See further J. Chem. Soc., June, 1919.)—J. C. D.

Gelatin; Chemical basis of the influence of acid upon the physical properties of —. *Amphoterie colloids. III.* J. Loeb. J. Gen. Physiol., 1919, 1, 363—385.

EXPERIMENTS on the combining power of gelatin and hydrobromic acid show that the curves representing the changes in the physical properties of gelatin are approximately parallel to those indicating the amount of bromine bound. (See preceding abstract; further J. Chem. Soc., June, 1919.)—J. C. D.

Gelatin; The influence of the valency of cations upon the physical properties of —. *Amphoterie colloids. IV.* J. Loeb. J. Gen. Physiol., 1919, 1, 483—504.

TWICE as many univalent cations as divalent cations combine with the same mass of gelatin. Curves representing the influence of several univalent cations on the physical properties of gelatin are closely similar to each other. The curves for the gelatinates of Ca and Ba are similar but differ from those of the univalent metal gelatinates. The conductivity curves for both types are, however, almost identical. An explanation of these results is advanced. (See further J. Chem. Soc., June, 1919.)—J. C. D.

PATENTS.

Leather substitute; Waterproof — and process for making the same. F. Rast-Rüttimann, Assignee of R. O. Crist-Döös, Lucerne, Switzerland. Eng. Pat. 117,628, 11.7.18. (Appl. 11,375/18.) Int. Conv., 18.7.17.

ANIMAL bladders are cut open, dried, dyed, tanned with a vegetable tannin, stretched and dried, and finally so treated by "fattening," fulling, and rolling or pressing that they become supple. To increase the thickness of the product two or more pieces may be glued together and pressed.—E. W. L.

Leather substitute. M. Scheuer, Assignor to C. Scheuer, New York. U.S. Pat. 1,291,180, 14.1.19. Appl., 23.11.17.

A LEATHER substitute is prepared by building up successive layers of a supple pyroxylin composition on a suitable support, until an integral structure of sufficient thickness to be removed intact from the support is produced.

Hides; Plant used in the treatment of — during soaking, liming, tanning, chroming, or like processes. A. N. Walker, Bolton. Eng. Pat. 124,992, 12.7.18. (Appl. 11,417/18.)

HIDES are suspended on lifting frames in pits constructed with a central partition the top of which is below the level of the liquid in the pits. The partition has an adjustable aperture at the bottom, and by the introduction of compressed air, gas, etc., circulation of the liquor in both sections can be set up in either direction. The compressed air is conveyed to the pit by a single pipe which before entering branches into two, one to each section, and by means of a two-way valve the gas can enter one section of the pit only at a time. The gas is conveyed to perforated pipes arranged along the bottom of each section. The pits can be emptied by means of compressed air into troughs running the whole length of a series of similar pits so that the liquors can be changed or strengthened without removing the hides from the pits.—D. W.

Chrome leather waste; Utilisation of —. A. Wolff, Hamburg. Ger. Pat. 310,309, 13.2.17.

THE waste is dissolved in sufficient sulphuric acid (about 5% concentration) at 80°—90° C., and after

removal of the separated fat the chromium is precipitated as hydroxide, together with calcium sulphate, by the addition of an excess of lime and is then converted into chrome alum. The gelatin is recovered from the solution after precipitating the dissolved lime and calcium sulphate by treatment with carbon dioxide and barium carbonate. For trimmings as obtained in chrome tanneries the weight of 5% acid used is equal to that of the waste, whereas for waste from shoe factories the proportion of 5% acid is approximately three times as great.—D. F. T.

Tanning fish skins or the like; Process of — K. Bendixen, Copenhagen. Eng. Pat. 120,398, 26.10.18. (Appl. 17,486/18.) Int. Conv., 29.12.14.

SEE U.S. Pat. 1,235,543 of 1917; this J., 1917, 1056.

XVI.—SOILS; FERTILISERS.

Nitrogen including nitric nitrogen; Determination of total — [in soils]. B. S. Davisson and J. T. Parsons. J. Ind. Eng. Chem., 1919, 11, 306—311.

Two hundred c.c. of the soil extract is placed in a Kjeldahl flask, together with sufficient 50% sodium hydroxide solution to make the alkalinity approximately $N/10$, 4 drops of oil, and 1 gm. of Devarda's alloy (Al 45, Cu 50, Zn 5; this J., 1893, 550). The flask is connected with an absorption tower containing 35 c.c. of sulphuric acid (4:1), and the contents of the flask are boiled for 20 mins.; the flame is then removed and the acid solution in the tower allowed to flow into the flask. The boiling is continued for a few mins., the tower is rinsed with water, the rinsings are added to the flask, and the solution evaporated until charring commences. Five grms. of potassium sulphate is then added, the mixture is digested in the usual way, and the ammonia distilled after the addition of sodium hydroxide and sodium sulphide.—W. P. S.

"Electro-potash," a Swedish potash fertiliser, and its action on mineral soils. P. Ehrenberg, O. Nolte, E. Haslinger-Hahn, and I. P. van Zyl. J. Landw., 1918, 66, 209—240.

"ELECTRO-POTASH" contains 11% of potassium as silicate which is almost completely soluble in warm hydrochloric acid (20%). It is obtained in the reduction of potash minerals in the electric furnace (see Eng. Pat. 23,898 of 1912; this J., 1913, 364) as a dark coloured slag, which is ground and sifted for the market. Experiments were made extending over two years comparing "electro-potash" with potassium salts as fertilisers on sand and loam soils. Spring wheat and buckwheat were the crops grown and six crops were grown in succession in each experiment. It was found that "electro-potash" produced very poor results, even when lime was applied along with it. About 12% of the potash from the "electro-potash" was recovered in the crop, whereas about 74% of the potash in potassium sulphate and chloride was recovered. The results on a loam soil were similar to those on a sandy soil.—J. H. J.

Barium and strontium; Effect of certain compounds of — on the growth of plants. J. S. McHargue. J. Agric. Res., 1919, 16, 183—194.

In the absence of calcium carbonate, both barium and strontium carbonates exert a toxic effect on plants, the former more so than the latter. In the presence of calcium carbonate they both appear to exert a distinct stimulating influence on the growth of the plants studied. The root growth of the

plants was accelerated in all cases where either of these carbonates was added to the sand in which the plants were growing. Neither barium nor strontium can replace calcium as a plant food. Barium sulphate is much more toxic than barium carbonate. Increasing the amount of strontium nitrate added to the sand gave a corresponding increase in the nitrogen content of wheat grown therein.—W. G.

Ammonia; Extraction of — from liquid manure, urine, and other ammoniacal liquids. O. Lemmermann and H. Wiessmann. Mitt. Deuts. Landw.-Ges., 1918, 33, 16—21. Biedermann's Zentr., 1919, 48, 8—10.

By blowing air into liquid manure, 95% of the ammoniacal nitrogen can be expelled. Temperature and proportion of air are important; the concentration of the solution and the height of the column of liquid are subordinate. Raising the temperature to 56° C. assists the expulsion of ammonium carbonate from dilute solution.—J. H. J.

Wheat; Effect of manganese on the growth of —. A source of manganese for agricultural purposes. J. S. McHargue. J. Ind. Eng. Chem., 1919, 11, 332—335.

MANGANESE, in suitable dilution, stimulates the growth of wheat, and increases the size and nitrogen content of the grain. In pot cultures, the best results were obtained by the addition of 5 grms. of manganese carbonate per 8.5 kilos. of soil, a quantity equivalent to 0.028% of manganese. Basic slag contains about 5% of manganese and it is possible that some of the benefit to crops resulting from the use of this fertiliser, on certain soils, may be due to the presence of manganese.—W. P. S.

Dextrose and levulose; Utilisation of — by the higher plants. H. Colin. Comptes rend., 1919, 168, 697—699.

FROM an examination of etiolated leaves of beet-root, artichoke, and chicory the author produces further evidence in support of the view that the plant cell utilises levulose more rapidly than dextrose.—W. G.

Maize cultivated and sheltered from bacteria; A purely mineral solution capable of assuring the complete evolution of —. P. Mazé. Ann. Inst. Pasteur, 1919, 33, 139—173.

THE results of water culture experiments indicate that boron, aluminium, fluorine, and iodine, in addition to nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, chlorine, silicon, manganese, and zinc are essential to the complete development of maize. Organic substances, excluding the organic reserves of the seed, although not indispensable, exert a beneficial influence on the growth of the plant, when added to the mineral nutrient solution. The iron should be present in the ferric state.—W. G.

Plants; Action of coal gas on —. V. Action on trees. Hydrocyanic acid as the most detrimental constituent of coal gas. C. Wehmer. Ber. deuts. botan. Ges., 1918, 36, 460—464. (See also this J., 1918, 745 A.)

IN many instances, the detrimental effect of coal gas on the root systems of trees is not immediately noticeable but becomes apparent after the period of winter rest, when the trees almost invariably die. The most toxic constituent of the gas is hydrocyanic acid.—H. W.

Weeds; Eradication of — by sprays and manures. W. E. Brenchley. J. Bd. Agric., 1919, 26, 1474—1482.

CHEMICAL substances used as weed killers may be divided into two groups: (1) Those that destroy the weeds and have no beneficial action on the crops; they are usually applied in solution as sprays. (2) Those that destroy the weeds and exercise a manurial action on the crops, such as finely ground manures applied as dry powders when the plants are wet. The most common sprays are copper sulphate, iron sulphate, and sulphuric acid. Copper sulphate is used in a 4–5% solution and 50 galls. applied per acre. It has proved effective for charlock, spurry, and poppy. Nickel sulphate has proved to be an efficient substitute. Iron sulphate is used in 15% solution and 40 galls. applied per acre. It is effective for charlock, poppy, and corn buttercup. Sulphuric acid is the most powerful spray used. In 5% solution it has destroyed bracken on grass land. It is effective on most annual and biennial weeds. The results obtained with finely ground manures have been variable and uncertain. Calcium cyanamide, kainit, salt, and lime have been tried.—J. H. J.

Nitrate and nitrite assimilation. Baudisch. See VII.

Seaweeds. Albert and Krause. See VII.

Powdery mildews. Eyre and others. See XIXa.

PATENTS.

Calcium cyanamide; Process and apparatus for making —. G. E. Cox, Niagara Falls, N.Y., Assignor to American Cyanamid Co., New York. U.S. Pat. 1,292,715, 28.1.19. Appl., 3.12.17.

CALCIUM cyanamide is prepared by the interaction of calcium carbide and nitrogen in a furnace containing a perforated chamber for the calcium carbide, and a heat insulating slab or partition to prevent the escape of a substantial portion of the heat from the upper surface of the carbide in the chamber.—C. A. M.

Fertiliser materials; Process of producing — and the products obtained therefrom. P. H. Carter, Savannah, Ga. U.S. Pat. 1,293,029, 4.2.19. Appl., 23.3.17. Renewed 20.11.18.

THE fertiliser comprises cyanamide, nitre cake, and "fertiliser stick" in dry form. (See also U.S. Pat. 1,279,838; this J., 1919, 24 A.)—J. H. J.

Fertiliser material; Manufacture of —. P. McG. Shuey, Savannah, Ga. U.S. Pat. 1,293,220, 4.2.19. Appl., 4.8.17.

GROUND phosphate-bearing material and molten nitre-cake are mechanically mixed together, and discharged from the mixing machine before solidification. The mass is allowed to age, and then disintegrated.—J. H. J.

XVII.—SUGARS; STARCHES; GUMS.

Sucrose; Determination of — in cane molasses by direct polarisation after destruction of the reducing sugars. P. L. Lohr, Archief Suikerind. Nederl.-Indië, 1917, 29, 1779—1786. Int. Sugar J., 1919, 21, 196.

THE author has examined the method proposed by Muller (this J., 1916, 858) for the determination of sucrose in cane molasses by direct polarisation,

after destroying the reducing sugars by heating with a reagent containing bismuth subnitrate, Rochelle salt, and sodium hydroxide. It was found that under the conditions specified the bismuth reagent has no influence on the sucrose, and that the products formed from invert sugar exhibit no optical rotation, but when the content of reducing sugars is high a large volume of bismuth reagent is required, and a correspondingly large volume of basic lead acetate is subsequently required for clarification, while a very voluminous precipitate is produced. When the content of reducing sugars is high, therefore, dilution is necessary, and the error in making the polarimetric reading is increased. It is concluded that, although the method may be useful for the rapid routine examination of sugar products containing less than 20% of reducing sugars, it can hardly be recommended, without modification, for factory control purposes.—J. P. O.

PATENT.

Decolorising carbon. Eng. Pat. 124,638. See IIb.

XVIII.—FERMENTATION INDUSTRIES.

Fermentation of fruit wines; Influence of addition of nitrogenous substances on the —. H. Müller-Thurgau and A. Osterwalder. Landw. Jahrbuch der Schweiz, 1917. Chem.-Zeit., 1919, 43, Rep., 40.

THE spontaneous fermentation of apple- and pear-juices is very sluggish. The commencement of fermentation may be hastened by the use of pure yeast, and its progress much accelerated by addition of nitrogenous substances such as ammonia or ammonium chloride or phosphate. Such addition does not accelerate the fermentation of grape must in the same degree. Ammonia itself, however, has the disadvantage of reducing the acidity of the juices; chemically pure ammonium chloride is recommended, e.g., in quantities of 15–50 grms. per hectolitre.—J. H. L.

Alcohol from lichens. Ellrodt and Kunz. Brenner-Zeit., 1918, 6171. Chem.-Zeit., 1919, 43, Rep., 40.

Cladonia rangiferina (reindeer moss), which contains hemicelluloses convertible into sugar by acid hydrolysis, was found to contain 11.7% of water, 0.66% of nitrogen, 4.87% of ash, and 1.60% of ether extract. By suitable acid treatment it yielded 71.7% of extract containing 54.5% of sugar, and after fermentation 282 c.c. of alcohol was obtained per kilo. of the plant. The maximum yield of alcohol was obtained by steaming the plant for one hour under 3 atm. pressure, then adding 2.5% of 25% hydrochloric acid, steaming again for one hour under 3 atm., and finally neutralising and fermenting. The growth of yeast is normal, and fermentation may be accelerated by addition of phosphoric acid.—J. H. L.

[Proteolytic] enzymes of oil-seeds. Fernández. See XII.

PATENTS.

Organic salts [pyruvates and acetates] and acids [and acetone]; Manufacture of certain —. A. Fernbach, Paris, and E. H. Strange, London. Eng. Pat. 14,607, 15.10.15.

STERILISED mashes containing starch or sugars, or both, are fermented by *Amylomyces Rouxii* in presence of an alkaline-earth carbonate, and

aerated meanwhile with sterilised air or oxygen. From the filtered product a mixture of salts, consisting mainly of pyruvates and acetates, may be obtained, *e.g.*, by concentration, or precipitation with alcohol. The mixture of salts or the free acids may be oxidised entirely to acetates or acetic acid, which may be used for the production of acetone; or acetone may be produced by destructive distillation of the salt mixture without preliminary oxidation, a limited amount of air or oxygen being admitted during the process, if desired.—J. H. L.

Yeast contained in fermented molasses; Extraction of the —. L. J. P. M. J. Dupire, Ramecourt, France. Eng. Pat. 123,711, 26.7.18. (Appl. 12,250/18.) Int. Conv., 23.2.18.

The yeast is separated from fermented molasses, in a state of high vitality, by passing the molasses through a centrifugal apparatus of the cream separator type with a non-perforated bowl, and by so adjusting the position and section of the outlet orifices, the speed of rotation, and the supply of liquid, that the yeast is deposited on the walls of the bowl, whilst the impurities, owing to their lower density, are carried away in the molasses.

—J. H. L.

Acetone; Process for the production of —. J. H. Northrop, Assignor to The Rockefeller Institute for Medical Research, New York. U.S. Pat. 1,293,172, 4.2.19. Appl., 8.7.18.

Carbohydrate material is fermented by means of Bacillus aceto-ethylicum.—J. H. L.

Carbonating and filling liquids; Process of and apparatus for —. H. M. Smith, Chicago, Ill., U.S.A. Eng. Pat. 124,907, 10.4.18. (Appl. 6098/18.)

Yeast, mucorini, moulds, bacilli, and micro-organisms; Pure-culture apparatus for —. C. A. Jensen, London. From J. H. P. Magné, Mexico City. Eng. Pat. 124,237, 21.1.8. (Appl. 1195/18.)

SEE U.S. Pat. 1,212,656 of 1917; this J., 1917, 399.

Non-alcoholic malt beer; Manufacture of —. L. Block, Mamaroneck, N.Y., U.S.A. Eng. Pat. 124,330, 30.5.18. (Appl. 8925/18.)

SEE U.S. Pat. 1,271,269 of 1918; this J., 1918, 633 A.

XIXA.—FOODS.

Dough; Influence of electrolytes upon the viscosity of —. L. J. Henderson, W. O. Fenn, and E. J. Cohn. J. Gen. Physiol., 1919, 1, 387–397.

QUANTITATIVE measurements of the viscosity of dough at 30° C. were made in a torsion viscometer. The influence of the hydrogen ion concentration upon the viscosity of dough prepared from different flours was studied. The viscosity in all cases showed a minimum value a little on the acid side of $p_H=5$, the value which has been found to be the best hydrogen ion concentration for bread-making (see this J., 1912, 405) and for the rising of dough. The addition of a small amount of salt tends to diminish the viscosity. As the concentration of the salt increases, however, there is commonly a rise. The influence of salts upon viscosity is variable with the hydrogen ion concentration. The significance of these results in the light of practical bread-making is discussed.

—J. C. D.

Bread; Control of rope in —. E. J. Cohn, S. B. Wolbach, L. J. Henderson, and P. H. Cathcart. J. Gen. Physiol., 1919, 1, 221–220.

THE investigation was carried out on a strain of *B. mesentericus* isolated from rony bread. The morphological and cultural characteristics of the organism are described. Its relationship to the production of characteristic rope has been proved beyond question. A hydrogen ion concentration sensibly higher than $10^{-8}N$ completely inhibits the growth of the organism. For this reason the hydrogen ion concentration of bread should, when possible, be maintained near that value. Methyl red is recommended as a convenient indicator for ascertaining when the acidity of bread is of that order.—J. C. D.

Gluten; Study of the action of acid and alkali on —. L. J. Henderson, E. J. Cohn, P. H. Cathcart, J. D. Wachman, and W. O. Fenn. J. Gen. Physiol., 1919, 1, 459–472.

STUDIES were made of the acid-base equilibrium in systems containing gluten suspended in solutions of hydrochloric acid and sodium hydroxide. The results appear to show that simple chemical phenomena are most important in such systems. (See further J. Chem. Soc., June, 1919.)—J. C. D.

Sausages and meat pastes; Estimation of the approximate quantity of meat in —. G. Stubbs and A. More. Analyst, 1919, 44, 125–127.

A METHOD used in the Government Laboratory for estimating meat in sausages etc. is based upon the fact that beef and pork (free from fat) contain on the average 3.75 and 4.0% of nitrogen respectively, whilst the usual filling materials contain about 40% of water, and, with the exception of soya meal, about 50% of carbohydrate and crude cellulose and 1% of nitrogen. Fat is determined by drying 5 grms. of the sample for 30 mins. on the water-bath, and extracting the fat by macerating the dried mass with ether, whilst nitrogen is determined by the Kjeldahl method. The amount of carbohydrate and crude cellulose is found by deducting the quantity of proteins and ash from the amount of non-fatty solids. The result multiplied by 2 gives the approximate amount of bread or cereal filling material containing 40% of water. The nitrogen derived from the meat is obtained by deducting 1% of the weight of the "filler," and the percentage of fat-free meat is calculated by multiplying the meat nitrogen by $\frac{100}{3.75}$ in the case of beef

or mutton, $\frac{100}{4.0}$ in the case of pork, or by $\frac{100}{3.87}$ in the case of mixtures. The amount of fat is added to that of the fat-free meat to obtain the total amount of meat. Only when a large amount of maize meal is present is a correction required. The additional water (*i.e.*, water other than that naturally present in the meat or in the "filler" containing 40% water) is obtained by deducting from 100 the sum of the percentages of the "filler" and the total meat. The total percentage of water directly determined should be equal to the sum of 40% of the filling material, 75% of the fat-free meat, and the additional water calculated as described. The difference should not exceed 2%, unless a meal such as soya meal, richer in nitrogen than ordinary cereals, has been used.—C. A. M.

Sausages, meat pastes, and army rations; Analysis of —. A. W. Stokes. Analyst, 1919, 44, 127–132.

THE following method of analysis has been devised to determine whether sausages complied with the

"Food Control Regulations" which prescribed two grades containing respectively 50% and 67% of meat:—Total solids, water, and ash are determined on 5 grms. of the material, and the ash examined for boric acid. Fat-free meat and starch are determined by boiling 10 grms. of the sample for an hour with 5% alcoholic sodium hydroxide solution beneath a reflux condenser. This dissolves the meat, forms a soap with the fat, and leaves the starch unaltered. After collecting the starch on a slag-wool filter and washing it with hot alcohol, the filtrate and washings are cooled, made up to 250 c.c. with water, 25 c.c. evaporated to about 15 c.c. to remove alcohol, and the fatty acid in this is determined by the Schmid method, as in milk analysis. The slag-wool filter and starch are returned to the original flask and treated with 100 c.c. of a cold 5% aqueous solution of sodium hydroxide, the flask being left for an hour, with occasional shaking. The resulting solution of starch is made up to 500 c.c. with cold water, filtered through a plug of slag-wool, and the starch precipitated from 50 c.c. of the filtrate by adding 100 c.c. of 90% alcohol, and, after standing for 30 minutes, it is collected on counterpoised filters, washed with alcohol, dried, and weighed. It is assumed that the quantity of fatty acids equals 95% of the actual fat. The "dry meat" is obtained by deducting the starch and fat from the total solids. To this is added 2.33 times its weight of water to find the amount of fat-free flesh. An addition of 0.66 times its weight of water is added to the starch to obtain the amount of bread. Frequently the water is in excess of this allowance owing to the fact that crusts are soaked in water before incorporation with the sausages, but it is exceptional for less than the allowed proportion of water to be present. The ash consists mainly of salt, and usually averages about 2%. Typical analyses of sausages, meat pastes, and army rations are cited. In the case of sausages and meat pastes the excess of water not natural to the meat or bread reached about 24% and 35% respectively.—C. A. M.

Seaweeds. Albert and Krause. See VII.

[*Proteolytic*] *enzymes of oil-seeds.* Fernández. See XII.

Reduction of methylene blue by milk. Harvey. See XXIII.

PATENTS.

Drying edible pastes; Process of —. K. Gammel, Assignor to The Cleveland Macaroni Co., Cleveland, Ohio. U.S. Pat. 1,284,305, 12.11.18. Appl., 1.9.11. Renewed 5.4.18.

EDIBLE paste in short sections is fed on to a travelling band to form a mass several layers deep, and is subjected to an air current until the outer layer is partially dried. It then falls on to a lower band travelling in the opposite direction to the first, so that the dried layer is buried and a fresh layer is exposed. This process is repeated until the sections are dried and slightly polished. The velocity of the air current may be reduced in the earlier stages of the process.—J. H. J.

Dryer [for food products]. E. C. Horst, San Francisco, Cal. U.S. Pats. (A) 1,294,804 and (B) 1,294,805, 18.2.19. Appls., 25.4.18 and 24.6.18.

(A) An apparatus for drying food products consists of a tunnel through which air is forced in one direction whilst the products to be dried are advanced step by step in the opposite direction.

By means of baffles the air is caused to pass upward and downward through the product and under and over it alternately. Means are provided for increasing the temperature and humidity of the air during its passage through the tunnel. (B) The dryer comprises a housing through which extend a number of inclined perforated cylinders each with an independent feed and discharge opening. The cylinders are revolved and hot air is passed between, and longitudinally and transversely through them.—J. H. P.

Preserving matter; Process for —. F. S. Benenati, Syracuse, N.Y. U.S. Pat. 1,292,401, 21.1.19. Appl., 31.5.18.

THE animal or vegetable matter to be preserved is saturated with an agent containing a germicidal oil of a plant of the *Allium* family and then dried. On immersing the dried matter in water it is restored to its original condition.—J. H. J.

XIXb.—WATER PURIFICATION; SANITATION.

Effluent from the Miles acid process of sewage treatment; De-oxygenating effect of the —. F. W. Mohlman. J. Ind. Eng. Chem., 1919, 11, 325—327.

THE effluent from the Miles acid process of sewage treatment (this J., 1918, 439 A) contains sulphur dioxide and sulphites which are oxidised at the expense of the dissolved oxygen in the water into which the effluent is discharged. The sulphur dioxide and sulphites may, however, be oxidised by aeration for a short time (30 mins.) with a relatively small volume of air (about 0.1 cb. ft. per gall.) before the effluent is discharged.

—W. P. S.

Stenches and odours; Investigation [use] of — for industrial purposes. V. C. Allison and S. H. Katz. J. Ind. Eng. Chem., 1919, 11, 336—338.

SUBSTANCES possessing a strong odour are used for detecting leaks in boilers, drains, etc., and the authors describe an apparatus for determining the suitability of various substances for this purpose. A number of Venturi type flow meters were so arranged that a measured volume of air could be passed at a uniform rate through or over the substance and then mixed with another volume of pure air also flowing at a uniform rate. The concentration was found from the loss in weight of the substance. The air mixture was passed through a rubber tube with a glass funnel at the open end, and one inhalation was taken to determine the intensity of the odour. The odours were classified as "detectable," "faint," "quite noticeable," "strong," and "very strong." Of the 24 substances examined, artificial musk had the strongest odour, 0.00004 mgrm. being detectable in 1 litre of air; then followed amyl thioether and phenyl isocyanide (0.001 to 0.002 mgrm. per litre of air).—W. P. S.

Mildews; Powdery — and the ammonium polysulphide wash. J. V. Eyre, E. S. Salmon, and L. K. Wormald. J. Bd. Agric., 1919, 25, 1494—1497. (See this J., 1916, 378.)

AMMONIUM polysulphide wash can be used to kill powdery mildews, such as American gooseberry-mildew, when the fruit is ripening, since the wash leaves no visible deposit on the fruit. A stock solution of the wash is prepared by saturating 1 gall. of concentrated ammonia with hydrogen

sulphide and adding 2 galls. of concentrated ammonia and 1125 oz. of flowers of sulphur; more hydrogen sulphide is then passed in until the sulphur dissolves. This stock solution is diluted for use with 0.5% soap solution. The wash is applied as a fine spray, either in one application of a 1 in 50 dilution of the stock solution or in two applications of a 1 in 100 dilution.—J. H. J.

"*Peroxide*"; Analysis of —. F. Mach and P. Lederle. Chem.-Zeit., 1919, 43, 117—118.

THE following method is recommended for the determination of the cerite earths in "peroxide," which consists chiefly of the sulphates of these earths (see this J., 1918, 348 A); its efficacy as a fungicide depends on the latter. Ten grms. of the sample is boiled for 15 mins. with 500 c.c. of water, cooled, diluted to 500 c.c., and filtered; 50 c.c. of the filtrate is treated with 5 c.c. of 10% sulphuric acid and 5 c.c. of 5% ammonium acetate solution, boiled, and excess of saturated oxalic acid solution is added. After standing for 18 hrs., the precipitate is collected, washed with hot water, ignited, and weighed. Slight variations in the amount of free sulphuric acid present or large differences in the volume of the total solution do not affect the results obtained. Samples examined by the authors contained from 43 to 47% of cerite-earth oxides.—W. P. S.

Arsenical poisoning in the industries of coal and its derivatives (arsenical coal poisoning). A. Bayet and A. Slosse. Comptes rend., 1919, 168, 704—706.

A CAREFUL examination of the symptoms of workmen engaged in the briquette industry and suffering from an illness known as "maladie du brai" ("pitch cancer"; see this J., 1913, 416; 1914, 741, 895) shows that they resemble in every respect those exhibited by a person suffering from chronic arsenical poisoning. Further, arsenic was found to be present in the pitch used, in the dust in the air of the factories, and in the hair, urine, and blood of the workmen. These remarks apply similarly to the illnesses occurring amongst the workmen in a number of industries connected with coal and its derivatives, and presumably the poisoning arises from the presence in the coal of arsenical pyrites.—W. G.

Chloropicrin; High toxicity of — towards certain lower animals and the possibility of using this substance as a parasiticide. G. Bertrand. Comptes rend., 1919, 168, 742—744.

THE effect of chloropicrin on caterpillars, the larvæ of *Lepidoptera* and *Hymenoptera*, and on aphids has been examined and the results show that exposure for 5—10 minutes in an atmosphere containing 0.01—0.02 grm. per litre is sufficient immediately to kill the larvæ and aphids. Even lower concentrations are effective against the larvæ, if the duration of exposure is increased. In aqueous solution chloropicrin is also very toxic to infusoria and amœbæ.—W. G.

PATENTS.

Separator and filter for purifying water for use in steam generators and for manufacturing purposes. W. R. Austin, Monkseaton. Eng. Pat. 124,130, 28.6.18. (Appl. 10,639/18.)

WATER to be purified is passed upwards through a spiral channel or coil situated in a settling chamber. The coil has openings along the lower

side for the passage of sediment into the settling chamber, where it falls to the bottom and is removed through a drain cock. The coil has also openings along the upper side for the passage of oil and other light matter into the settling chamber where they rise to the surface and can be removed. The coil is kept fully immersed in the water in the settling chamber. From the top of the coil the water passes through a valve into a filter, or set of filters, within which is a stand pipe carrying a lantern-shaped (hexagonal or octagonal) frame holding the filtering medium. The water passes inwards through the medium to the stand pipe, in which are openings for the escape of the water to a collecting channel below the filter.—J. H. J.

Filtering apparatus [for water]. C. S. Smith, Brooklyn, N.Y. U.S. Pats. (A) 1,293,649, (B) 1,293,650, and (C) 1,293,651, 4.2.19. Appls., (A) 10.5.13, (B) 7.8.13, (C) 6.4.14. Renewed (A) 6.6.18, (B) 13.6.18, (C) 26.6.18.

(A) A TANK is provided with a series of transverse partitions of ring form carrying wire mesh screens of different metals with the edges of each pair of screens in contact with each other, forming galvanic couples. The metals in the screens alternate in character throughout the series. (B) The apparatus is made in portable form. A frame supports the filter tank with a water reservoir above. A pump is connected with the reservoir and delivers measured quantities of water under pressure to the filter. (C) The partitions consist of perforated dish-shaped members of different metals with their edges in contact. A separator comprising crossed members is placed between the perforated members.—J. H. J.

Liquid-sterilising device. W. B. Fenn, Assignor to The Wedoit Co., Columbus, Ohio. U.S. Pat. 1,292,742, 28.1.19. Appl., 16.6.13.

THE liquid to be sterilised flows under pressure through a perforated tube whereby it is broken up. Steam under pressure surrounds the tube, and the commingled liquid and steam are discharged through a regulated opening which maintains the desired pressure and temperature.—J. H. J.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloids; Method for the evaluation of —. Rapp. Apoth.-Zeit., 1918, 33, 463. Chem. Zentr., 1919, 90, II., 210.

THE alkaloids are precipitated from acid aqueous solution by the addition of an alkali and are then extracted by means of chloroform; for the latter operation the aqueous solution is converted into a thick mud by the addition of plaster of Paris, so that the chloroform separates readily. The alkaloids in the combined chloroform extracts are then dissolved out by N/10 or N/100 hydrochloric acid and the excess acid is measured by titration of an aliquot portion using methyl red as indicator. The method possesses the advantage of economy in time and material.—D. F. T.

Alkaloids; Rapp's method for the determination of —. K. Dieterich. Pharm.-Zeit., 1918, 63, 628—629.

RAPP's method (see preceding abstract) has given extremely satisfactory results, but it is important that the quantity of plaster added should be such

that the mixture does not harden but remains as a soft paste. In the original method it is necessary to make sure by an extra shaking with 10 c.c. of chloroform that all the alkaloid has been extracted from the mass. This uncertainty may be avoided by dissolving the alkaloid in chloroform before adding the plaster and then using an aliquot portion of the filtered extract for the determination. For instance, in the valuation of cinchona bark, the substance is treated with the quantity of liquid recommended by Rapp and then shaken in the same flask with 50 c.c. of chloroform, made alkaline, and shaken with 25 grms. of plaster of Paris. The chloroform is then filtered off, and the filtrate (42–45 c.c.) shaken with N/10 acid. The plaster paste in this method may be of any degree of stiffness, as it does not have to be washed out, all the alkaloid having been dissolved by the chloroform before the addition of the plaster. It is suggested that the principle of Rapp's method might be extended to other extraction operations besides those with alkaloids, since the plaster has a clarifying effect and assists the separation of the extract.—J. F. B.

Plants; Microchemistry of —. XII. *Large silicious bodies in the leaf of Arundo donax.* XIII. *Behaviour of cystoliths towards salts of silver and other metals.* H. Molisch. Ber. deuts. botan. Ges., 1918, 36, 474–481.

ALL the cystoliths examined possess the property of reducing silver nitrate or silver sulphate so strongly that they become blackened after a short time. The deposition of silver is due to calcium carbonate which encrusts the cystoliths, and the action provides a confirmatory microchemical method of detecting calcium carbonate in the plant. Cystoliths become coloured red to bluish-violet in gold chloride solution, rust-red in ferrous sulphate, pale green in nickel sulphate, and lilac or pink in cobalt chloride or cobalt sulphate; the colorations are due to the precipitation of the corresponding hydroxides by calcium carbonate. (See also J. Chem. Soc., 1919, i., 113 and 242).—H. W.

Glucoside, loroglossin; Discovery of a new —. Application of the biochemical method to the study of several species of indigenous orchids. E. Bourquelot and M. Bridel. Comptes rend., 1919, 168, 701–703.

A NUMBER of species of orchids, when examined by the method previously described (this J., 1901, 1214), were found to contain sucrose, one or more glucosides hydrolysable by emulsin, and a considerable amount of a dextro-rotatory substance not attacked by enzymes. From one of these species of orchids, *Loroglossum hircinum*, Rich., a new glucoside loroglossin, m.pt. 137° C. (corr.), $[\alpha]_D = -42.97^\circ$, was isolated.—W. G.

Odorous principles of plants; Distribution and characters of some of the —. F. B. Power. J. Ind. Eng. Chem., 1919, 11, 344–352.

A DESCRIPTION is given of some of the more important odorous substances obtained from plants, including their distribution, preparation, and chemical characters. The plants dealt with are:—*Coniferae*, *Gramineae*, *Palmæ*, *Liliaceae*, *Iridaceae*, *Zingiberaceae*, *Orchidaceae*, *Aristolochiaceae*, *Anonaceae*, *Myristicaceae*, *Lauraceae*, *Cruciferae*, *Rosaceae*, *Geraniaceae*, *Myrtaceae*, *Umbelliferae*, *Ericaceae*, *Labiatae*, and *Compositae*.—W. P. S.

Scammony and its substitutes. W. L. Scoville. J. Ind. Eng. Chem., 1919, 11, 335–336.

SEVERAL botanical species, closely allied, are now sold as scammony or scammony substitutes. A

specimen of a Mexican plant, *Resina drastica*, received by the author closely resembled the drug known as Mexican scammony, *Ipomæa orizabensis*, but the resin extracted from it differed from that of the latter. The characters of the resins, together with that of true scammony resin, *Convolvulus scammonia*, are as follows:—

	True scammony resin	Mexican scammony resin	<i>Resina drastica</i> resin
Yield, %	About 8	9 to 20	19.2
Colour	Yellowish-brown	Straw	Lemon yellow
Ash	Trace	Trace	Trace
Solubility in:			
Petroleum spirit	3.5%	2.5%	1.0%
Ether	Soluble	Soluble	72.6%
Ethyl acetate ..	Soluble	Soluble	Soluble
10% ammonia	Cloudy soln.	Cloudy soln.	94%
10% KOH soln.	Cloudy soln.	Cloudy soln.	Cloudy soln.
Acid value	20	23.5	28
Saponif. value ..	198	140	136
Optical rotation ..	-17.3	-24.8	-32.4
Colour with FeCl ₃	Dark green	Faint green	Dark green

—W. P. S.

"Mustard gas" [dichloro-ethyl sulphide]; Continuous vacuum still for —. E. D. Streeter. J. Ind. Eng. Chem., 1919, 11, 292–294.

THE crude dichloroethyl sulphide ($\text{CH}_2\text{Cl}.\text{CH}_2\text{Cl}.\text{S}$), was passed upwards through a preheater consisting of a coil made from 50 ft. of $\frac{1}{2}$ in. lead pipe and surrounded by an oil bath at 150° C.; a gas separator also heated at 150° C., placed above the preheater, removed the hydrochloric acid and other vapours from the liquid, and these vapours were conducted to a series of absorption, scrubbing, and condensing vessels. The liquid portion collecting in the gas separator flowed down a vaporising tube, consisting of a vertical iron pipe $9\frac{1}{4}$ ft. long and 3 in. in diameter and surrounded by an oil jacket heated at 183° C.; the lower end of the vaporising tube entered a chamber heated at 150° C., where non-volatile substances were separated and drawn off, whilst the "mustard gas" vapour passed to a condenser and receiver. Suitable valves on the connecting pipes enabled the flow of liquid to be regulated, and the distillation was carried out under reduced pressure, the average pressure in the system being 60 mm.—W. P. S.

Salicylic acid; Volumetric determination of — in the presence of salicylaldehyde. R. Berg. Chem.-Zeit., 1919, 43, 129.

A COLOURLESS solution of salicylaldehyde yields a yellow coloration when treated with a trace of alkali; the colour is destroyed by acids and even by carbon dioxide. The aldehyde may, therefore, be used as the indicator in the titration of salicylic acid in a solution also containing salicylaldehyde. To determine salicylic acid in an ethereal solution containing both substances, the solution is extracted several times with N/20 sodium-bicarbonate solution and then with water; the last aqueous extract must give a yellow colour with a drop of alkali solution. If this is not the case, all the acid has not been removed and the extraction must be repeated. The united extracts are titrated with N/20 sulphuric acid; this is added in small quantities at a time and the solution boiled to expel carbon dioxide. The final disappearance of the yellow colour denotes the end-point of the titration.—W. P. S.

Vanillin; New method for the determination of — in vanilla extract. A. W. Dox and G. P. Plaisance. Amer. J. Pharm., 1919, 91, 167–170.

THE method depends on the condensation of vanillin with thiobarbituric acid to form 3-methoxy-4-hydroxybenzaldehydylthiourea (this J., 1916, 1182,

1234). To the weight of the precipitate obtained as previously described is added 2.6 mgrms.; this solubility correction is constant and does not depend on the amount of vanillin present. A sensitive test for caramel consists in treating the extract, after clarification and removal of excess of lead chloride, with phloroglucinol; in the presence of caramel a brown precipitate is formed. If caramel is absent, the vanillin gives a pink precipitate.—W. P. S.

Monomethylaniline; Preparation of —. P. F. Frankland, F. Challenger, and N. A. Nicholls. Chem. Soc. Trans., 1919, 115, 198–205.

REDUCTION of the condensation product of aniline and formaldehyde with zinc dust and concentrated aqueous sodium hydroxide gives rise to monomethylaniline, yields up to 55% of the theoretical being obtainable; the monomethylaniline thus formed contains only traces of dimethylaniline but is rich in aniline which, however, can be removed easily as its zincchloride; a large excess of formaldehyde causes an increase in the proportion of dimethylaniline present, probably on account of the further interaction of the monomethylaniline and formaldehyde with subsequent reduction by the zinc and sodium hydroxide. By heating aniline hydrochloride with methyl alcohol in an autoclave at 180°–200° C., a 55% yield of monomethylaniline is obtainable, the yield being hardly altered by the presence of glacial acetic acid. The demethylation of dimethylaniline by heating with aniline hydrochloride for six hours at 200° C. is capable of giving a 55% yield of monomethylaniline. Aniline in monomethylaniline can be fairly accurately estimated by treatment with an aqueous solution of anhydrous zinc chloride, the resulting zincchloride precipitate being washed with light petroleum and weighed; the monomethylaniline is conveniently estimated by conversion into the corresponding nitrosoamine which can be separated by extraction with ether.—D. F. T.

Carbonyl chloride; Identification and estimation of —. A. Kilng and R. Schmutz. Comptes rend., 1919, 168, 773–775.

CARBONYL chloride readily reacts with aniline in aqueous solution, provided the aniline is in excess: $\text{COCl}_2 + 4\text{C}_6\text{H}_5\text{NH}_2 = \text{CO}(\text{NHC}_6\text{H}_5)_2 + 2\text{C}_6\text{H}_5\text{NH}_2\cdot\text{HCl}$. The diphenylurea is insoluble in water and may be readily separated and identified by its crystalline structure and melting point. Thus if air is bubbled at the rate of 1 litre in 5 mins. through a saturated aqueous solution of aniline, the presence of the carbonyl chloride in the air is indicated by formation of a precipitate of diphenylurea. In this way carbonyl chloride may be detected in air at a dilution of 1 in 100,000. For the estimation of carbonyl chloride in solution in organic solvents, a definite volume of the solution containing 0.2–0.35 grm. of the chloride is added to 150 c.c. of aqueous aniline solution (containing 26 grms. of aniline per litre) and after two hours the mixture is heated on a water-bath for one hour to drive off the organic solvent. The liquid is allowed to cool and the next day the diphenylurea is collected in a Gooch crucible, dried at 70° C., and weighed.—W. G.

Selenium compounds; Meta-substituted aromatic —. F. L. Pyman. Chem. Soc. Trans., 1919, 115, 166–175.

By the action of an ethereal solution of magnesium phenyl bromide on selenium, a mixture of diphenyl diselenide and selenophenol is obtained which on oxidation with nitric acid yields phenylselenious acid, $\text{C}_6\text{H}_5\text{SeO}_2\text{H}$; oxidation with potassium

permanganate converts the mixture into potassium phenylselenate, $\text{C}_6\text{H}_5\text{SeO}_3\text{K}$, whereas treatment with sulphuric acid and potassium nitrate causes nitration with formation of *m*-nitrophenylselenious acid, $\text{NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{SeO}_2\text{H}$, yellow prismatic needles, m.pt. 156°–157° C. (corr.). This acid is oxidised by alkaline potassium permanganate to *m*-nitrophenylselenic acid, $\text{NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{SeO}_2\text{H}_2\text{O}$, which when anhydrous melts at 146° C. (corr.), whilst reduction of the nitrophenylselenious acid with aqueous sodium bisulphite produces di-*m*-nitrophenyl diselenide ($\text{NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{Se}$)₂, yellow spears melting at 83° C.; this can be further reduced by sodium sulphide with formation of di-*m*-aminophenyl diselenide ($\text{NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{Se}$)₂, the hydrochloride of which forms yellow needles melting at 291°–292° C. (corr.) with decomposition. On oxidation with cold nitric acid of sp. gr. 1.4, the diacetylaminophenyl diselenide is converted into *m*-acetylaminophenylselenious acid, $\text{C}_6\text{H}_4\text{O.NH.C}_6\text{H}_4\cdot\text{SeO}_2\text{H}$, colourless needles melting at 209° C. (with decomposition), which is oxidised by ammoniacal potassium permanganate to *m*-acetylaminophenylselenic acid, $\text{CH}_3\cdot\text{CO.NH.C}_6\text{H}_4\cdot\text{SeO}_2\text{H}$; this was isolated as the barium and sodium salts, the former salt on treatment with sulphuric acid undergoing hydrolysis with formation of *m*-aminophenylselenic acid, $\text{NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{SeO}_2\text{H}$. The meta-position of the nitrogenous substituent group in the benzene ring was confirmed by the production of a diaminophenyl diselenide, identical with that described above, by reduction of the *m*-nitrophenyl selenocyanate prepared from *m*-nitroaniline.—D. F. T.

Catalytic dehydrogenation by nickel in the presence of hydrogen. P. Sabatier and G. Gaudion. Comptes rend., 1919, 168, 670–672.

HYDROCARBONS of the benzene series and terpenes when passed with hydrogen over nickel at 180° C. are hydrogenised, but if the temperature is raised to 350°–360° C. dehydrogenation also occurs. Thus at the higher temperature pinene, limonene, and camphene yield a mixture of cymene with some cumene; menthene gives cymene; cyclohexene gives benzene. The reaction may also be applied to oxygenated derivatives of the hydrocarbons. Cyclohexanol yields phenol; pulegone gives a mixture of cresol and thymol; eucalyptol, terpin, and terpineol undergo dehydration as well as dehydrogenation. The mixture obtained by the destructive distillation of oil of turpentine, which is poor in benzenoid hydrocarbons, when passed with hydrogen over nickel at 350°–360° C. gives a liquid in which the proportion of benzenoid hydrocarbons is notably increased.—W. G.

Ether vapour; Spontaneous inflammation of mixtures of air and —. E. Alilaire. Comptes rend., 1919, 168, 729–730.

THE mixture of ether vapour and air was led into a U-tube heated in an oil-bath, one limb of the U-tube being provided with internal projections similar to a Vigreux tube (this J., 1919, 200 A). Under these conditions, it was found that spontaneous inflammation of a mixture of air and ether vapour occurred at about 190° C., when the amount of ether in the gaseous mixture reached 1 grm. per litre. Ordinary catalysts (iron oxides, copper, nickel, etc.) had no influence on the phenomenon. No reaction took place at the ordinary temperature.—W. G.

Calomel; Preparation of a very voluminous —. P. Duret. Ann. Inst. Pasteur, 1919, 33, 174–176.

CALOMEL may be obtained in a light, voluminous form, which is three times as bulky as the samples

prepared either by sublimation or by the usual precipitation methods, if the following procedure is adopted. Three solutions are prepared containing (1) 11.5 grms. of mercuric chloride and 10 drops of hydrochloric acid in 100 c.c. of water, (2) 6 grms. of sodium bicarbonate and 10 grms. of dextrose in 80 c.c. of water, (3) 7.5 grms. of crystalline magnesium chloride in 20 c.c. of water. Solutions (2) and (3) are mixed and then added to (1). After the reaction has finished the mixture is heated on a water-bath until no more carbon dioxide is evolved, and the finely-divided precipitate is then collected and washed with cold water. In this form the calomel has much greater germicidal properties when used in prophylactic ointments or antisyphilitic injections, than in the form as it is usually prepared.—W. G.

PATENTS.

Chlorhydrins; Process of making — [from oil-gas]. K. P. McElroy, Washington, D.C., Assignor to Chemical Development Co. U.S. Pat. 1,295,339, 25.2.19. Appl., 8.2.17.

GASEOUS olefinic hydrocarbons, in the form of oil-gas, mixed with chlorine, are passed up a heated vertical tower which is spanned by a succession of perforated plates and down which a hot current of aqueous liquid flows. The flow of aqueous liquid is sufficiently copious to maintain the vapours substantially free from hydrochloric acid and the vapours are removed for condensation at the top of the tower.—D. F. T.

Mercury solutions suitable for injection; Production of — by means of succinimide. Chinoïn Fabrik Chem.-pharm. Produkte A.-G. von Kereszty und Wolf. Ger. Pat. 310,213, 30.3.17.

THE sparingly soluble mercury derivatives of phenol-sulphocarboxylic acids, such as sulphosalicylic acid, and of phenol mono- and di-sulphonic acids or their halogen substitution products can be dissolved in water if succinimide is added; the resulting solutions on treatment with dilute acids give a precipitate of the original mercury compound. Solutions prepared in the described manner are very stable and cause no pain or local effect when injected.—D. F. T.

Crystallisation of [phenacetin]. Eng. Pat. 124,324. See I.

Organic salts etc. Eng. Pat. 14,607. See XVIII.

Acetone. U.S. Pat. 1,293,172. See XVIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

PATENT.

Toning process for photographic silver prints. Graphikus-Ges., Hamburg. Ger. Pat. 309,447, 6.10.17.

By successive application of gold and selenium toning baths so that the metallic silver in the print is almost completely replaced by gold and red selenium, a tone is produced equal to that previously obtained only by platinum toning or a combined gold-platinum toning, and in permanency the prints are superior to those obtained by the latter processes.—D. F. T.

XXII.—EXPLOSIVES; MATCHES.

Smokeless powder; Analysis of —. C. F. van Duin, L. P. F. van der Grinten, and P. van der Woude. Rec. Trav. Chim. Pays-Bas, 1919, 38, 163–169.

DETAILS are given for the estimation of nitroglycerin, guncotton, acetone, humidity, stabiliser (diphenylamine), vaseline, graphite, sodium bicarbonate, dinitrotoluene, and resin. 5 grms. of the finely divided powder is extracted for five hours with ether, and the ether allowed to evaporate. The extract is dried and weighed. It consists, from nitrocellulose powders, of diphenylamine, a portion of the resin, and dinitrotoluene if present. From nitroglycerin powders the extract consists of diphenylamine, a portion of the resin, nitroglycerin, and vaseline if present. For the first type of powder the resin in the extract is dissolved in 8% sodium hydroxide and estimated by the method described by Kast (*Anleitung zur chem. und physik. Untersuchung der Spreng- und Zündstoffe*, Braunschweig, 1909) and the diphenylamine is estimated in a fresh portion of the powder (see Kast, *loc. cit.*). The dinitrotoluene is obtained by difference. The ether extract obtained from a nitroglycerin powder is extracted with 85% acetone, which dissolves all but the vaseline, which is weighed. The acetone is evaporated from the filtrate, and the residue examined as described for the extract from nitrocellulose powder. Graphite is estimated in another portion of the powder (not crushed) by boiling the powder with 25% sodium hydroxide, filtering through a Gooch crucible, and washing the residue in turn with water, alcohol, ether, and benzene, and weighing the residue after ignition. For the estimation of sodium bicarbonate 5 grms. of the powder is carefully gelatinised with 50 c.c. of acetone and then diluted with 30 c.c. of alcohol. 100 c.c. of water is then added, drop by drop at first, and finally an excess of dilute standard hydrochloric acid. After one hour, the mixture being shaken at intervals, the excess acid is titrated with *N*/10 sodium hydroxide. For the estimation of the resin present in the residue after extracting the original powder with ether, the residue is treated as described for the estimation of sodium bicarbonate and finally boiled with 25 c.c. of 25% hydrochloric acid for half an hour. After cooling, the residue is filtered off, dried, and again extracted with ether. For the estimation of acetone, 20 grms. of the powder is distilled with steam, and the distillate after standing overnight is filtered and made up to 300 c.c. From 100 c.c. of this the acetone is converted into iodoform, which is filtered off and weighed. Moisture is estimated by drying the powder for fifteen hours in a current of dry air.—W. G.

Detonator compositions; Analysis of —. A. Wogrinz. Z. angew. Chem., 1919, 32, 79–80.

FROM 0.8 to 2 grms. of the material is weighed in a small closed glass vessel, which is then opened and exposed in a vacuum desiccator over sulphuric acid for 24 hours, to determine the moisture. The dry residue is transferred to a small Erlenmeyer flask containing 4 to 5 c.c. of water. This flask has a ground-in stopper, through which passes a tube connected at its upper end with an enlargement below the tap of a thistle funnel, whilst another tube passes from the enlargement into a second open Erlenmeyer flask containing water. From 25 to 30 c.c. of strong hydrochloric acid is slowly introduced into the decomposition flask, which is then heated for about 10 mins. over a small flame, until only sulphur and any powdered glass remain undissolved. After cooling, the contents of the flask are treated with about 5 grms.

of crystallised tartaric acid and filtered, and the insoluble residue ignited and weighed. The filtrate is diluted to 250–300 c.c., and the antimony and mercury precipitated with hydrogen sulphide. The precipitate is collected on a dried weighed filter and washed with hydrogen sulphide water slightly acidified with acetic acid. Iron (from the antimony sulphide) and potassium are determined in the filtrate and the chlorate calculated from the potassium. The precipitate is heated on the water-bath for about 15 mins. with about 200 c.c. of dilute ammonium sulphide (1:1), and the undissolved mercury sulphide is washed successively with dilute ammonium sulphide, water, alcohol, ether, carbon bisulphide, ether, and alcohol, and dried at 100° C. and weighed. Each 1 gm. of mercuric sulphide is equivalent to 1.2625 gm. of mercury fulminate.

—C. A. M.

Mixed acid control. Hearsey and Joyce. See XXIII.

PATENTS.

Picric acid; Manufacture of —. N. H. Graesser and A. W. Titherley, Ruabon, Denbigh. Eng. Pat. 14,367, 11.10.15.

DURING the nitration of sulphonated phenol the temperature is maintained for approximately 8 hours between the limits of 110° C. and 118° C. either by external regulation or by commencing the reaction at 80° to 95° C. An increased yield is thus obtained and undue loss of nitric acid prevented.—T. St.

Explosives. W. Rintoul, D. Cross, and Nobel's Explosives Co., Ltd., Stevenston, Ayrshire. Eng. Pat. 14,656, 16.10.15.

A SMALL proportion (0.1 to 1% calculated on the nitroglycerin) of aromatic nitro-compounds dissolved in nitroglycerin has the effect of gelatinising completely in the cold all classes of nitrocellulose from the soluble variety up to gun-cotton containing 13% of nitrogen, and gelatinisation so carried out takes place more quickly than when nitroglycerin alone is used at 60° to 70° C. Suitable nitro-compounds are mono-, di-, or trinitrotoluene, mononitronaphthalene, dinitrobenzene, and nitroxylenes, and they may be used singly or in mixtures of two or more. In the manufacture of nitroglycerin-nitrocellulose blasting explosives containing more than 50% of nitroglycerin, the aromatic nitro-compound is dissolved in the nitroglycerin, and the nitrocellulose and any other ingredients are then stirred in. The mixing is completed in the usual manner but without elevation of temperature.—T. St.

Explosives. W. Rintoul, D. Cross, and Nobel's Explosives Co., Ltd., Stevenston, Ayrshire. Eng. Pat. 14,655, 16.10.15.

OTHER materials capable, when dissolved in nitroglycerin, of effecting the gelatinisation of nitrocellulose in the cold (see previous abstract) are:—urethanes, or esters of carbamic acid; anilides; substituted ureas; condensation products of glycerol and other polyhydric alcohols with aldehydes; homologues of oxanilic ester; the well-known solvents of nitrocellulose such as acetone, ethyl acetate, and amyl acetate. These substances, the first five classes of which act also as stabilisers, are used singly, or as mixtures of two or more, in the proportion of 0.1 to 1% calculated on the nitroglycerin.—T. St.

Explosive. W. Rintoul, E. G. Beckett, and Nobel's Explosives Co., Ltd., Stevenston, Ayrshire. Eng. Pat. 14,706, 18.10.15.

DICYNODIAMIDINE perchlorate, $C_2H_4N_4O.HClO_4$, may be used alone or in mixtures as a blasting or military high explosive. A suitable blasting explosive

is composed of dicyanodiamidine perchlorate 69, sodium nitrate 29, woodmeal 2%; and a suitable shell-filling composition is ammonium nitrate 80, trinitrotoluene 10, dicyanodiamidine perchlorate 10%. Dicyanodiamidine perchlorate may be prepared by adding a solution of barium, strontium, or calcium perchlorate to a solution of dicyanodiamidine sulphate (obtained from dicyanodiamide), filtering, and evaporating the filtrate. It may also be prepared by adding a hot concentrated solution of sodium perchlorate to a solution of dicyanodiamidine hydrochloride; on cooling, dicyanodiamidine perchlorate crystallises out.

—T. St.

Explosives; Manufacture of —. Perchlorate Safety Explosives, Ltd., and H. Harris, London. Eng. Pat. 14,932, 21.10.15.

POWDERED ammonium or potassium perchlorate capable of passing through a 60-mesh sieve is gradually added to molten paraffin wax in a suitable mixing machine, until the mixture contains about 82% of ammonium perchlorate or 83½% of potassium perchlorate. The waxy mass obtained on cooling may be pressed to any desired shape or used in the form of powder or granules.

—T. St.

Explosive. A. J. Marin, Stockholm, Sweden. U.S. Pat. 1,293,154, 4.2.19. Appl., 6.8.17.

A COMPRESSED solid safety explosive, detonating freely in the open air with a No. 6 detonator, is prepared by mixing ammonium perchlorate, sodium nitrate, and a nitro-hydrocarbon with a small quantity of water, and compressing the mixture to give it a density of 1.25–1.6 after drying.

—T. St.

Gunpowder; Process of manufacturing —. J. Buxbaum, Georgetown, Wash. U.S. Pat. 1,293,326, 4.2.19. Appl., 28.12.17.

BLACK gunpowder is mixed with spirits of camphor into a plastic mass which is then thoroughly dried.

—T. St.

Explosive and process of manufacturing the same. K. V. Nielsen and J. P. Larsen, Aarhus, Denmark. U.S. Pat. 1,293,882, 11.2.19. Appl., 20.1.15.

THE explosive contains sulphur, potassium and ammonium nitrates, glycerin, a starchy substance, resin, and pyrolusite.—T. St.

Sulphuric acid [spent nitrating acid]; Process of removing nitrous and nitric acids from —. D. Tyrer, Stockton-on-Tees. Eng. Pat. 17,541, 15.12.15.

THE acid is treated in the presence of an oxidising agent with a substance capable of being nitrated to a nitro-compound insoluble in sulphuric acid. For example, spent nitrating acid containing 70% or less of sulphuric acid and 1–10% of nitrous and nitric acids is introduced at about 110° C. along with air and toluene vapour, at the top of a tower packed with coke. The mixture issuing from the bottom of the tower is run into a separation tank, from which the purified sulphuric acid, containing less than 1% of nitric acid, is drawn off to the concentrators, whilst the residual mixture of toluene and nitrotoluene is used for making trinitrotoluene. Acid fumes and any toluene vapour escaping from the bottom of the tower pass through a pipe to coolers and scrubbers.—S. S. A.

Nitrocellulose; Process of recovering solvent from colloided —. W. F. Nash, Kenvil, N.J., Assignor to Hercules Powder Co., Wilmington, Del. U.S. Pat. 1,293,515, 4.2.19. Appl., 7.3.18.

THE ether-alcohol solvent remaining in colloided nitrocellulose is recovered by first displacing the ether by means of alcohol and then displacing the alcohol by means of water.—T. St.

Frictionally-ignitable material [e.g., *match composition*]; *Apparatus for powdering* — C. L. Pfersch, Barberton, Ohio, Assignor to The Diamond Match Co., Chicago, Ill. U.S. Pat. 1,293,188, 4.2.19. Appl., 20.9.17.

A CONTAINER, capable of being vibrated, has a floor portion in which are spaced screen sections. Groups of reducing bars, alternating with the screen sections, are loosely mounted so as to permit of their independent movement without contact with each other when the container is vibrated, and of their operating directly upon material on the floor portion. Means are provided for giving a relative jarring action between the container and the bars, certain of which in each section are maintained above the surface of the floor.—T. St.

XXIII.—ANALYSIS.

Solubility; Rapid determination of — T. J. Ward. *Analyst*, 1919, 44, 137.

ABOUT 3 c.c. of the solvent is heated in a test-tube immersed in water at 10° to 20° C. above the temperature at which the solubility is to be determined, and small quantities of the substance are added, with frequent shaking, until a portion remains undissolved. The test-tube is then transferred to a beaker containing water at the required temperature, and after about 10 mins. a thimble of folded filter paper is pushed down into the liquid, so that filtration proceeds inwards. From 0.5 to 20 c.c. is then withdrawn from the interior of the thimble, and transferred to a weighed dish, which is covered and again weighed. The solvent is evaporated, and the residue dried and weighed.

—C. A. M.

Standard alkali for mixed acid control. E. Hearsey and C. M. Joyce. *J. Ind. Eng. Chem.*, 1919, 11, 341.

THE authors confirm Hendrixson's recommendations (this J., 1915, 1118) as to the suitability of potassium acid phthalate in standardising alkali solutions.—W. P. S.

Starch-iodine reaction. I. M. Kolthoff. *Pharm. Weekblad*, 1919, 56, 391—404.

THE sensitiveness of the starch iodine reaction is increased by the presence of acids and salts, being a maximum in potassium iodide solution. The sensitiveness is diminished by rise in temperature and the presence of organic substances such as alcohols, albumin, etc. In the titration of dilute iodine solutions ($N/1000$) with equivalent thio-sulphate solutions, or *vice versa*, a correction is required. This correction was determined for various conditions and found to be a minimum in presence of hydrochloric acid to which potassium iodide had been added.—W. S. M.

Sulphates; Precipitation of — in the presence of iron. H. Koelsch. *Chem.-Zelt.*, 1919, 43, 117.

THE following average results were obtained on the analysis of barium sulphate precipitates obtained in the determination of sulphur in zinc blende. In 800 specimens precipitated from solutions after the iron had been removed:—Barium sulphate, 90.90; barium soluble in hydrochloric acid, 3.70; chlorine, 2.55; sulphide sulphur, 0.51; copper, 0.04; lead, 0.06; zinc, 0.09; iron, 0.14%. In 500 specimens precipitated in the presence of iron:—Barium sulphate, 89.10; barium soluble in hydrochloric acid, 4.16; chlorine, 2.87; sulphide sulphur, 0.50; copper, 0.07; lead, 0.23; zinc, 0.26; iron, 0.47%. The chief

impurity was barium chloride. The presence of iron seems to have caused larger quantities of copper, lead, and zinc to be occluded in the barium sulphate. Insufficient oxidation during ignition of the barium sulphate led to the production of barium sulphide by reduction of the sulphate.

—W. P. S.

Mercury; Electrolytic estimation of — without platinum electrodes. J. Guzmán and P. Poch. *Anal. Fis. Quím.*, 1918, 16, 742—755.

SATISFACTORY results are obtained in nitric acid solution with the use of a silver-plated copper cathode and a graphite anode. Electrolysis is carried out in cold slightly acid solution, the voltage not exceeding 3 volts. The same cathode may be used for several repetitions of the analysis, but the silver and mercury deposits must be removed each time. An ammoniacal mercury solution is electrolysed with an iron anode and copper cathode on which first nickel and then silver have been deposited. This cathode cannot be used for repetition analyses even after replating. A copper cathode on which mercury has been deposited can be used for repeated determinations if polished by brushing after each analysis. In alkaline cyanide solution a silver-plated copper cathode and an iron anode are used. The temperature is maintained at 50° C., and a voltage of 2.5 volts is applied. The method is accurate to 0.2%. With alkaline sulphide solutions the best results are obtained with an amalgamated copper cathode and an iron anode. Repeated use of the same cathode, even after brushing, leads to inaccuracies.—W. S. M.

Mercury; Gravimetric and volumetric determination of — precipitated as mercury zinc thiocyanate. G. S. Jamieson. *J. Ind. Eng. Chem.*, 1919, 11, 296—297.

A SOLUTION containing a mercuric salt is treated with a reagent prepared by dissolving 39 grms. of ammonium thiocyanate and 29 grms. of zinc sulphate in 1 litre of water; 25 c.c. of this reagent is sufficient to precipitate a quantity of mercury not exceeding 0.14 gm. After the reagent has been added, the mixture is diluted to 75 c.c., stirred, set aside for 1 hr., and the precipitated mercury zinc thiocyanate then collected, washed with water containing a small quantity of the reagent (water, 450, reagent, 5 c.c.), dried at 105° C. for 1 hr., and weighed. The weight obtained multiplied by 0.40258 gives the amount of mercury. Alternatively, the moist precipitate may be transferred to a stoppered bottle, treated with a cold mixture of 35 c.c. of concentrated hydrochloric acid and 10 c.c. of water. 7 c.c. of chloroform added, and the mixture titrated with standardised potassium iodate solution until the iodine first liberated disappears. The contents of the bottle must be shaken during the titration. The solution of the mercuric salt should be neutral or only slightly acid and must not contain copper, bismuth, nickel, or cobalt, as these are precipitated with the mercury zinc thiocyanate.

—W. P. S.

Sodium pyrogallate solution as an absorbent for oxygen. G. W. Jones and M. H. Melghan. *J. Ind. Eng. Chem.*, 1919, 11, 311—316.

TESTS made with solutions of widely differing concentration showed that the rate of oxygen absorption by sodium pyrogallate solutions increases with the dilution of the sodium hydroxide, but is proportional to the pyrogallol concentration for any given sodium hydroxide concentration. All sodium pyrogallate solutions prepared with sodium hydroxide solution of sp. gr. less than 1.30 evolve carbon monoxide, the quantity of the latter

increasing with the dilution; if the sample of oxygen being absorbed contains more than 95% of oxygen, carbon monoxide is evolved no matter what is the concentration of the sodium hydroxide solution. A reagent which gives a minimum amount of carbon monoxide and has a fairly high rate of absorption is prepared as follows:—Pyrogallol is dissolved in water in the proportion of 1 gm. per 3 c.c.; 2 parts of this solution is then mixed with 5 parts of 50% sodium hydroxide solution.

—W. P. S.

Milk; Relation between the oxygen concentration and rate of reduction of methylene blue by —. [Determination of oxygen in gaseous mixtures.] E. Harvey. J. Gen. Physiol., 1919, 1, 415–419.

A METHOD for determining oxygen in gaseous mixtures is based upon the reduction of methylene blue by milk and acetaldehyde. (See further, J. Chem. Soc., June, 1919.)—J. C. D.

Acetone, alcohol, and benzene; Determination of small quantities of — in air. Elliott and J. Dalton. Analyst, 1919, 44, 132–136.

THE air is aspirated through four absorption vessels consisting of narrow measuring cylinders fitted with Folin tubes (J. Biol. Chem., 1912, 11, 493) and connected, by long lengths of rubber tubing, with Winchester quart bottles fitted with siphons, the amount of water siphoning over affording a measure of the air drawn through the apparatus. At least 10 litres of air must be aspirated to obtain a sufficient quantity of the vapours for analysis. Acetone:—Messinger's method (this J., 1889, 138) was found to give accurate results, and so long as the temperature was kept low the error due to the formation of iodoform by the alcohol vapour in the air was negligible. Twenty c.c. of N/10 iodine solution and 5 c.c. of 20% sodium hydroxide solution are placed in one of the absorption cylinders and after passage of the measured volume of air the liquid is acidified with hydrochloric acid, and the excess of iodine titrated with thiosulphate solution. Alcohol:—A modification of Szeberényi's method (this J., 1915, 683) enables alcohol to be determined, without appreciable error being introduced by any acetone present. Twenty-five c.c. of a cold mixture of 100 c.c. of N/2 potassium bichromate solution, 100 c.c. of strong sulphuric acid, and 50 c.c. of water are introduced into another of the absorption cylinders, and a plug of cotton-wool placed in the inlet tube to prevent access of dust to the bichromate. After the absorption the liquid is transferred to a flask, the residue being washed in with 45 c.c. of water, so as to bring the volume of the liquid up to 75 c.c. The solution is boiled for 15 mins. under a reflux condenser, then cooled, treated with 100 c.c. of 2% sodium iodide, and the liberated iodine, corresponding to the bichromate left after oxidation of the alcohol to acetic acid, is titrated with N/10 thiosulphate solution (1 c.c. = 0.00115 gm. alcohol). Benzene:—Pfeiffer's method (Chem. Zeit., 1909, 23, 884) is more suitable for determining traces of benzene in air than the differential pressure method of Davis and Davis (this J., 1918, 644 A). The air is passed through 15 c.c. of a mixture of equal volumes of fuming nitric and strong sulphuric acids placed in one of the absorption cylinders fitted with a cork saturated with paraffin wax, whilst the fourth cylinder, containing 20 to 25 c.c. of 20% sodium hydroxide solution, is interposed between this cylinder and the siphon bottles to prevent corrosion of the rubber tubing. After the absorption the mixture of the acids is heated on the water-bath for 15 mins. to ensure complete nitration, cooled, diluted with water, rendered

faintly alkaline to litmus by the addition of 50 c.c. of 40% sodium hydroxide solution, and then faintly acid with hydrochloric acid. After dilution to about 500 c.c. it is extracted with three successive portions of ether, and the ether treated with about 0.5 c.c. of sodium hydroxide solution, then separated and distilled, and the residue of nitrobenzene heated on the water-bath to remove oxidation products of alcohol and acetone, and dissolved in 10 c.c. of alcohol. The alcoholic solution is heated for 10 mins. with 10 c.c. of a standard solution of stannous chloride, and after cooling the excess is titrated with N/10 iodine solution (1 c.c. = 0.00065 gm. benzene). The following amounts of these substances per million c.c. were found in the air of factories:—Acetone, min., 0.02; max., 1.86; mean, 0.31 gm. Alcohol, min., 0.02; max., 3.00; mean, 0.65 gm. Benzene, min., 0.01; max., 0.90; mean, 0.26 gm.—C. A. M.

Absorption by turbid media. Application to the estimation of suspensions. C. Chéneveau and R. Audubert. Comptes rend., 1919, 168, 766–768.

THE amount of material present in fine suspensions, where immediate sedimentation does not occur, may be determined by using the formula, $1 - I/I_0 = e^{-B/m^2}$, where I/I_0 is the coefficient of transmission of light for the suspension, M is the mass of the particles in the suspension, and B and β are constants depending on the nature of the particles and the wave length of the light used. The formula has been verified for certain heterogeneous suspensions of mastic and for suspensions of silver chloride and barium sulphate.

—W. G.

Natural gas. Anderson. See IIa.

Magnesite. Macri. See VII.

Bromate and iodate. Kolthoff. See VII.

Uranium in steels etc. Kelley and others. See X.

Copper and zinc in gelatin. Jamieson. See XV.

Ion-protein compounds. Loeb. See XV.

Nitrogen [in soils]. Davisson and Parsons. See XVI.

Sucrose in molasses. Lohr. See XVII.

Sausages etc. (1) Stubbs and More. (2) Stokes. See XIXa.

"Perocide." Mach and Lederle. See XIXb.

Alkaloids. (1) Rapp. (2) Dieterich. See XX.

Vanillin. Dox and Plaisance. See XX.

Salicylic acid. Berg. See XX.

Monomethylaniline. Frankland and others. See XX.

Carbonyl chloride. Kling and Schmutz. See XX.

Smokeless powder. Van Duin and others. See XXII.

Detonator compositions. Wogrinz. See XXII.

PATENTS.

Chemical apparatus [for gas absorption]. E. Hart, Easton, Pa. U.S. Pat. 1,293,423, 4.2.19. Appl. 24.9.18.

A VESSEL is provided with a stopper, and with gas inlet and outlet tubes connected to the bottom and top of the vessel respectively. The two tubes are brought to a position where they are adjacent to one another and are there controlled by a single valve or stopcock.—W. F. F.

Fabrics and other materials; Process and apparatus for testing [wearing qualities of] —. Schweizerische Versuchsanstalt für Textilindustrie, Assignees of Kontroll und Versuchsstelle für Textilindustrie an der Handelshochschule, St. Gallen, Switzerland. Eng. Pat. 124,183, 10.7.18. (Appl. 11,303/18.) Int. Conv., 13.3.18.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

August. Rotary muffle furnaces. 11,499. May 8.
Bentall and Bingham. Grinding and kibbling mills. 10,976. May 2.
Boberg, and Techno-Chemical Laboratories. Drying. 11,092. May 3.
British Thomson-Houston Co. (General Electric Co.). Automatically removing gases. 10,770. Apr. 30.
Cooper. 10,842. See V.
Cruse. Separation of pulverised material from air. 10,980. May 2.
Du Pont de Nemours and Co. Recovery of solvents. 11,182 and 11,183. May 5. (U.S., 8.8.18.)
English and Hannan. Stills etc. 11,412. May 7.
Fawcett, Preston, & Co. (Taylor). Vacuum etc. pans. 11,042. May 3.
Fletcher & Co., and Miller. Filters. 11,142 May 5.
Hardinge. 10,602. See X.
Loring. Apparatus for disseminating liquids in pulverised solids or mechanically breaking up liquids for drying them etc. 10,891. May 1.
MacLachlan. Apparatus for granulating etc. pasty or semi-fluid materials etc. 10,619. Apr. 29.
Millar and Reavell. Plant for leaching etc. 11,564. May 8.
Wade (Fours et Procédés Mathy Soc. Anon.). Furnaces. 11,113. May 3.

COMPLETE SPECIFICATIONS ACCEPTED.

15,084 (1916). Weir and Weir. Heating boiler feed water and its treatment to prevent corrosion in boilers. (126,014.) May 14.
9683 (1917). Hinchley. Apparatus for expressing liquid from materials. (125,672.) May 7.
1495 (1918). Barclay. Apparatus for removing suspended particles from gases. (125,681.) May 7.
6805 (1918). Smallwood. Furnaces. (125,744.) May 7.
7059 (1918). Hardinge. See X.
7382 (1918). Fox. Dehydrating and desiccating apparatus. (126,135.) May 14.
9319 (1918). Hoffmann. Means for spraying liquids and mixing therewith other liquids or gases. (125,800.) May 7.
11,229 (1918). Turner and Eames. Apparatus for automatically recording the supply of liquid to chemical and other plant. (126,209.) May 14.

115 (1919). Naaml. Vennoots. Vereen. Nederlandsche Rubberfabrieken. Filtering apparatus particularly applicable for use with thick liquids, plastic and colloidal materials. (122,627.) May 14.
3520 (1919). Miller, and Fletcher and Co. Filter presses and the like. (126,265.) May 14.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING, LIGHTING.

APPLICATIONS.

Andersson, Brady, and Deacon. Furnaces for distilling coal etc. 10,624. Apr. 29.
Beswick and Rambush. Destructive distillation of solid fuels. 10,883. May 1.
Coune. Gas washer and purifier. 10,713. Apr. 30.
Cowburn and Cowburn. Production of gases under pressure. 11,212. May 5.
Coxon and Williams. Renewal of filaments in metal-filament electric lamps. 11,338. May 7.
Dayton Metal Products Co. Fuel for internal-combustion engines. 11,438, 11,440, 11,441, 11,442. May 7. (U.S., 4 and 5.10.18, 1, 2 and 10.3.19.)
Doherty. Coal-carbonising furnaces. 11,774. May 10. (U.S., 7.9.18.)
Foster and Illingworth. Coke ovens. 11,807. May 10.
Joubert. Distillation of fuels. 11,901. May 2.
Maclaurin. Manufacture of lubricating-greases. 11,633. May 9.
Marks (U.S. Industrial Alcohol Co.). Liquid fuel. 10,712, 11,177, 11,178, 11,418. Apr. 30, May 5 and 7.
Marks (U.S. Industrial Alcohol Co.). Non-freezing fuel. 11,419. May 7.
Marks (U.S. Industrial Alcohol Co.). Production of liquid fuel. 11,420. May 7.
Mason and Newbury. Ray filter for cutting out heat rays of arc lamps etc. 11,762. May 19.
Quigley Furnace Specialities Co. Apparatus for production, transportation, and combustion of pulverulent fuel. 11,386. May 7. (Fr., 8.5.18.)
Roos. Production of explosive mixtures for internal-combustion engines. 10,351. May 2.
Ross and Young. Production of violet and ultra-violet light. 11,579. May 8.
Southcombe and Wills. Lubricating etc. oils. 10,593. Apr. 29.
West and Wild. Retorts for distillation of carbonaceous materials. 11,413. May 7.

COMPLETE SPECIFICATIONS ACCEPTED.

9780 (1915). Ciselet and Deguide. Purification of distillation gases of coal. May 7.
12,262 (1916). Dellwick and Cutler. See VII.
9906 (1917). Thomsen. Production of light mineral oils from petroleum. (126,089.) May 14.
2132 (1918). Stewart. Gas producers. (125,686.) May 7.
5014 (1918). Mulliner and Kent. Treatment of carbonaceous substances. (125,698.) May 7.
5704 (1918). Cross. Transforming heavy hydrocarbon oils into lighter oils. (126,103.) May 14.
7131 (1918). Bancroft and Hansford. Gas retorts. (126,121.) May 14.
7246 (1918). Stobart. Washers for coal and the like. (125,781.) May 7.
7435 and 8296 (1918). Parker and Abrahams. Apparatus for generating from incandescent carbonaceous material, fuel gas for use in internal-combustion engines. (126,140 and 126,172.) May 14.
8583 (1918). Marks (Soc. Franco-Belge de Fours à Coke). Horizontal coke ovens. (126,180.) May 14.
26,941 (1918) and 195 (1919). Dempster and Ballingall. See VII.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

Craddock. 10,761. *See* XXIII.
 Marks (Soc. Franco-Belge de Fours à Coke). Continuous distillation and fractionation of crude benzols etc. 10,864. May 1.
 Stephenson. Dealing with acid sludge produced in purification of benzol and recovering benzol and sulphuric acid therefrom. 10,918. May 2.

COMPLETE SPECIFICATIONS ACCEPTED.

13,423 (1916). Tyrer. Separating phenol or its homologues from aqueous liquid. (125,625.) May 7.
 15,960 (1916). Comp. des Prod. Chim. d'Alais et de la Camargue. Preparation of benzenemonesulphonic acid. (126,039.) May 14.
 16,843 and 17,377 (1916). Macdonald and Calvert. Manufacture of nitrophenols. (126,062 and 126,084.) May 14.
 11,072 (1918). Gibbs, Lewis, and Selden Co. Purification of anthraquinone. (125,836.) May 7.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

A'Brassard and Crawford, and Buckle. Manufacture of indophenolic substances. 11,101. May 3.
 British Saccharine Manufacturing Co., and Harding. Manufacture of colouring matters from *p*-toluenesulphochloride or *p*-toluenesulphamide. 10,560. Apr. 29.
 British Saccharine Manufacturing Co., and Harding. Manufacture of colouring matters from *p*-toluenesulphochloride. 10,648. Apr. 30.
 Ellis (Chem. Works formerly Sandoz). Manufacture of yellow disazo dyestuffs. 10,887. May 1.
 Thompson (Poulenc Frères, and Meyer). Manufacture of diaminoacridine etc. 10,797. May 1.

COMPLETE SPECIFICATION ACCEPTED.

7609 (1918). Morton, Dandridge, and Morton Sundour Fabrics, Ltd. Production of a colouring-matter. (126,112.) May 14.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

Cooper. Drying fibrous, granular, etc. material. 10,842. May 1.
 Dunville and Co., and Gilmour. Production of solutions of cellulose acetates and nitrates, including celluloid, for use as varnishes, lacquers, and dopes. 11,077. May 3.
 Henderson. Fibrous compositions. 10,734. Apr. 30.
 Murray. Preserving and waterproofing medium. 10,841. May 1.
 Schofield. Wool lubricants. 10,839 and 11,078. May 1 and 3.
 Skinner. Preparation of pulp or fibrous material for making paper, papier mâché, string, fabrics, etc. 10,599. Apr. 29.
 Thiry. Paper-making machines. 11,787. May 10.

COMPLETE SPECIFICATIONS ACCEPTED.

12,917 (1916). Vickers, Ltd., and McKechnie. Manufacture of fabrics for airships, balloons, etc. (125,617.) May 7.
 13,354 (1916). Perkin, Mandleberg, and Mandleberg and Co. Impregnated and coated fabrics. (125,622.) May 7.
 13,685 (1916). Vickers, Ltd., and McKechnie. Fabrics for the gas bags of aircraft. (125,636.) May 7.
 8342 (1918). Cross and Bevan. Treatment of fibrous cellulose for the production of hydrated derivatives. (126,174.) May 14.

2129 (1919). Dubot. Funnels or thread-guides for use in making artificial threads. (126,263.) May 14.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

Ashworth. Machines for dyeing etc. yarns in hanks, skeins, or bundles. 10,822. May 1.
 Lascot. Printed designs on textile fabrics. 10,941. May 2.

COMPLETE SPECIFICATION ACCEPTED.

10,298 (1918). Calico Printers' Assoc., and Fourniaux. Production of black on vegetable textile fibres, silk fibres, or mixtures of the same. (126,201.) May 14.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Bergve. Decomposition of alkalinous and aluminous minerals. 11,654. May 9. (Norway, 27.5.18.)
 Catlett. Oxy salt compositions. 11,621. May 9. (U.S., 9.5.18.)
 Craig. 10,836. *See* X.
 Desachy. Manufacture of anhydrous zinc sulphide. 11,184. May 5. (Fr., 19.10.17.)
 Desachy. Manufacture of mixtures of barium sulphate and zinc sulphide. 11,185. May 5. (Fr., 19.10.17.)
 Desachy. Manufacture of anhydrous zinc sulphide for use as a pigment. 11,186. May 5. (Fr., 19.10.17.)
 Desachy. Conjoint manufacture of zinc sulphide and barium sulphate. 11,187. May 5. (Fr., 19.10.17.)
 Jones, and Newell and Co. 11,019. *See* XVI.
 Langwell. Manufacture of finely-divided barium carbonate. 11,793. May 10.
 Levin. 11,436. *See* XI.
 Marks (American Lead Pencil Co.). Manufacture of pencil lead. 11,422 and 11,423. May 7.
 Mooney. Manufacture of chromium sulphate. 11,213. May 5.
 Rogers (Blisey). Compound for washing, cleaning, etc. 10,730. Apr. 30.
 White (Becker Bros.). 10,618. *See* XI.

COMPLETE SPECIFICATIONS ACCEPTED.

12,262 (1916). Dellwick and Cutler. Recovering hydrogen from a mixture of hydrogen and air. (125,596.) May 7.
 12,405 (1916). Washburn. Manufacture of nitric acid and other products. (125,601.) May 7.
 12,566 (1916). C.I. Syndicate and others. *See* XI.
 12,567 (1916). C.I. Syndicate, Jenkins, Blackmore, and Howard. Manufacture of chlorates of the alkalis. (125,609.) May 7.
 12,914 (1916). Leitch. Manufacture of highly concentrated nitric acid. (125,616.) May 7.
 13,297 (1916). Tyrer. Manufacture of ammonium nitrate. (125,621.) May 7.
 16,668 and 17,322 (1916). Scott and Howles. *See* XI.
 17,368 (1916). Maxted and Ridsdale. Manufacture of nitric acid and oxides of nitrogen. (126,083.) May 14.
 1058 (1918). Bailey, Denny, and Dunk. Production of ammonium perchlorate. (125,677.) May 7.
 6383 (1918). Ashcroft. Removal of oxygen from gaseous mixtures. (125,714.) May 7.
 8025 (1918). Uthelm. Manufacture of acetic acid. (116,279.) May 7.
 15,389 (1918). Gregory. Recovery of tin compounds. (125,879.) May 7.

26,941 (1918). Dempster and Ballingall. Reducing operations in hydrogen-making plants. (126,251.) May 14.
 195 (1919). Dempster and Ballingall. Manufacture of hydrogen. (126,256.) May 14.

VIII.—GLASS; CERAMICS.

COMPLETE SPECIFICATIONS ACCEPTED.

9297 (1918). Wade (Carborundum Co.). Manufacture of refractory articles. (126,192.) May 14.
 12,896 (1918). Dressler Tunnel Ovens, Ltd., and Rushton. Kilns or ovens for firing bricks, pottery, etc. (126,218.) May 14.
 14,542 (1918). Kraus. Manufacture of refractory material. (126,223.) May 14.
 674 (1919). Haddan (Corning Glass Works). Borosilicate glass for use as a filter to produce daylight effects. (125,920.) May 7.
 675 (1919). Haddan (Corning Glass Works). Potash glass for use as a filter to produce daylight effects. (125,921.) May 7.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Ambrose and Mathews. Manufacture of a plastering material or constitutional cement. 10,584. May 1.
 Convert-Villejean, Lécorché, et Cie. Manufacture of wood substitutes. 11,166. May 5. (Fr., 25,14.)
 Henderson. Bituminous binders. 10,735. Apr. 30.
 Otto. Seasoning wood. 10,605. Apr. 29.
 Watson. Manufacture of bricks. 10,609. Apr. 29.

COMPLETE SPECIFICATIONS ACCEPTED.

11,904 (1918). Otto. Seasoning wood. (125,846.) May 7.
 12,896 (1918). Dressler Tunnel Ovens, Ltd., and Rushton. See VIII.
 14,625 (1918). Winqvist. Rotating kilns for burning cement etc. (126,230.) May 14.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Ballantine and Sulman. Production of ferro-alloys. 11,688. May 9.
 Bates. Fusible alloy. 10,847. May 1.
 Coles. Continuous process for coating metal plates with other materials. 11,006. May 3.
 Coles. Coating wire etc. with metals by electro-deposition. 11,008. May 3.
 Coles. Electro-deposition of copper-zinc alloy. 11,168. May 5.
 Collins. Recovery of tin from tin ores, residues, etc. 10,601. Apr. 29.
 Comp. des Forges de Chatillon-Commentry et Neuves Maisons. Manufacture of basic pig iron. 10,744. Apr. 30. (Fr., 20,219.)
 Craig. Recovering potash and other salts from blast-furnace gases. 10,836. May 1.
 Electrolytic Zinc Co. Treatment of zinc ores for recovery of zinc by electrodeposition. 10,490. Apr. 28. (Australia, 27,418.)
 Elliott. Removal of tin from tin plate. 11,197. May 5.
 Elmore. Extraction of lead and zinc from their ores. 10,885. May 1.
 Hardinge. Grinding or disintegrating ores etc. 10,602. Apr. 29.
 Hyde. Electric welding. 10,857 and 10,858. May 1.

Lenoir. Manufacture of manganese and its alloys in electric furnaces. 10,755. Apr. 30. (Fr., 8,114.)

McKechnie, and McKechnie Bros. Separating or recovering nickel from cupro-nickel alloys, scrap, etc. 11,725. May 10.

Musser. Centrifugal amalgamator and method of obtaining metal from ore. 11,655. May 9.

Owen. Electroplating. 11,332. May 6.

Partington, Taylor, and Vivian. Treatment of ores. 11,093 and 11,094. May 3.

Soc. Anon. Commentry-Fourchambault et Decazeville. Alloy. 10,604. Apr. 29. (Fr., 22,518.)

Sundberg and Thomasson. Manufacture of pure electrolytic copper from cement copper. 11,312. May 6.

White (Becker Bros.). 10,618. See XI.

COMPLETE SPECIFICATIONS ACCEPTED.

13,568 (1916). Hyde, Jude, and Belliss and Morcom. Impregnating and coating metals with other metals. (125,630.) May 7.

13,853 (1916). Mohr and Heberlein. Treatment of copper-nickel matte to separate the metals. (125,642.) May 7.

14,830 (1916). Whyte. Case-hardening. (125,666.) May 7.

15,278 (1916). Vautin and others. See XXII.

16,307 (1916). Jarvis. Manufacture of iron and steel. (126,046.) May 14.

16,389 (1916). Hadfield. Manufacture of steel. (126,049.) May 14.

16,459 (1916). Hadfield. Alloys. (126,053.) May 14.

7059 (1918). Hardinge. Conical tube mills for grinding ores etc. (126,114.) May 14.

7311 (1918). Burr. Production of alloys from volatile substances or metals, and other metals. (125,785.) May 7.

7648 (1918). Stabilimenti Blak Ing. A. Pouchain. Process for refining alloys. (116,277.) May 14.

7665 (1918). Clevenger. Electrolytic production of zinc. (115,846.) May 14.

12,219 (1918). Berglund. Extraction of zinc in electric furnaces. (120,549.) May 7.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Bell and Brearley. Water cooler and electrode economiser for electric furnaces. 11,492. May 8.

Coles. 11,168. See X.

Colquhoun and Niblett. Electrolytic treatment of liquid, granulated, or solid substances. 11,507. May 8.

Electrolytic Zinc Co. 10,490. See X.

Hazlehurst, and Lithanode, Ltd. Primary electric batteries. 10,881. May 1.

Hyde. 10,857 and 10,858. See X.

Imbery. Electric muffle furnaces. 11,466. May 8.

Lemaire. Electric accumulators. 11,694. May 9.

Lenoir. 10,755. See X.

Levin. Electrolytic gas-generators. 11,436. May 7. (U.S., 22,517.)

Oldham and Oldham. Galvanic batteries. 11,206. May 5.

Owen. 11,332. See X.

White (Becker Bros.). Electrolytic cell, and method of operating same to produce oxides and powders of metals and alloys. 10,618. Apr. 29.

COMPLETE SPECIFICATIONS ACCEPTED.

12,566 (1916). C. I. Syndicate, Jenkins, Blackmore, and Howard. Electrolytic oxidation process, and apparatus therefor. (125,608.) May 7.

16,668 (1916). Scott and Howles. Electric furnaces for fixation of nitrogen. (126,058.) May 14.
 17,332 (1916). Scott and Howles. Nitrogen fixation furnaces. (126,080.) May 14.
 7387 (1918). Hawkins. Electric accumulator cells. (115,635.) May 14.
 7665 (1918). Clevenger. *See* X.
 12,219 (1918). Berglund. *See* X.
 14,859 (1918). Fuller Accumulator Co., and Jones. Electrodes for primary and secondary batteries. (125,871.) May 7.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Davis and Whatnall. Wax-hardening process. 10,475. Apr. 28.
 Dayton Metal Products Co. 11,439. *See* XX.
 Downs and Hawley. Extraction of oils and fats from seeds, nuts, etc., by means of a solvent. 10,833. May 1.
 Hydro-Sewage Contractors, and Reynard. Dehydrating and purifying wool fat. 11,208. May 5.

COMPLETE SPECIFICATION ACCEPTED.

1849 (1919). De Raedt. Apparatus for extracting oils, fats, sugar, etc. (126,262.) May 14.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Clark. Damp-proof washable distemper. 11,596. May 9.
 Desachy. 11,184—11,187. *See* VII.
 Dunville and Co., and Gilmour. 11,077. *See* V.
 COMPLETE SPECIFICATION ACCEPTED.
 18,253 (1918). Kohler. Production of a shellac substitute. (120,729.) May 7.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

COMPLETE SPECIFICATION ACCEPTED.

4941 (1918). Dunlop Rubber Co., and Twiss. Vulcanisation of rubber and similar materials. (125,696.) May 7.

XV.—LEATHER; BONE; HORN; GLUE.

COMPLETE SPECIFICATION ACCEPTED.

15,702 (1918). Schlackmann. Dressing, fleshing, and unhairing skins. (126,234.) May 14.

XVI.—SOILS; FERTILISERS.

APPLICATIONS.

Jones, and Newell and Co. Manufacture of superphosphates and like manures. 11,019. May 3.
 Watson and Young. Utilisation of sewage sludge etc. for producing manure etc. 10,592. Apr. 29.
 COMPLETE SPECIFICATION ACCEPTED.
 0445 (1918). Marks (Soc. Anon. Ital. Ansaldo & Co.). Production of fertilisers. (125,714.) May 7.

XVII.—SUGARS; STARCHES; GUMS.

COMPLETE SPECIFICATION ACCEPTED.

1849 (1919). De Raedt. *See* XII.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATIONS.

Marsan and O'Sullivan. 10,715. *See* XIX.
 Takamine. Diastatic composition, and process of making same. 11,673. May 9. (U.S., 20.8.18.)

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Allport and Vickers. Preparation of preserved meats. 10,809. May 1.
 Ames. Apparatus for aerating sewage etc. 10,489. Apr. 28.
 Loring. Preparation of foods. 10,890. May 1.
 Marsan and O'Sullivan. Treatment of yeast to obtain a food resembling extract of meat. 10,715. Apr. 30.
 Watson and Young. 10,592. *See* XVI.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Commercial Research Co. Manufacture of chlorhydrins of gaseous olefines etc. 10,923. May 2. (U.S., 3.5.18.)
 Dayton Metal Products Co. Hydrogenation. 11,439. May 7. (U.S., 5.10.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

10,211 (1918). Pegram. Manufacture of preparations of addition compounds of iodine and hexamethylenetetramine. (117,451.) May 14.
 3542 (1919). Crosfield and Sons, and Hilditch. Manufacture of acetaldehyde. (125,926.) May 7.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATION.

Tarlton. Plates for making photographs in colours. 10,831. May 1.

COMPLETE SPECIFICATION ACCEPTED.

7641 (1918). Kerotype, Ltd., and Middleton. Photographic printing paper and transfer processes. (126,149.) May 14.

XXII.—EXPLOSIVES; MATCHES.

APPLICATION.

Marks (Du Pont de Nemours & Co.). Composition for detonators. 11,417. May 7.

COMPLETE SPECIFICATIONS ACCEPTED.

12,404 (1916). Howles. Explosive. (125,600.) May 7.
 14,814 (1916). Blackmore, Cooke, and Jenkins. Explosives. (125,663.) May 7.
 15,062 (1916). Marks (Spica). Manufacture of ballistite. (126,013.) May 14.
 15,278 (1916). Vautin, and Produce Mortgage Trust. Use of aluminium waste in the manufacture of explosives etc. (126,021.) May 14.
 16,616 (1916). Rintoul, and Nobel's Explosives Co. Explosives. (126,056.) May 14.
 17,328 (1916). Graesser and Williams. Drying picric acid. (126,077.) May 14.
 17,329 (1916). Graesser and Williams. Separation and recovery of picric acid. (126,078.) May 14.
 18,906 (1917). Adde. Explosives. (112,618.) May 14.
 9137 (1918). Tisell. Explosive. (116,890.) May 14.
 9632 (1918). Tisell and Pillaume. Explosives. (126,196.) May 14.

XXIII.—ANALYSIS.

APPLICATION.

Craddock. Penetration machines for testing viscous substances. 10,761. Apr. 30.

I.—GENERAL; PLANT; MACHINERY.

Agglomeration of granular masses. F. G. Donnan. Trans. Faraday Soc., 1919, 14, 12–13.

The principal factors causing the agglomeration of masses are stated to be (1) unequally distributed stress, (2) unequal size of granules, (3) existence of unstable or metastable forms, and (4) sheared or "flowed" crystal surfaces, these factors resulting in solution or re-solution in one portion of the material and precipitation in another.—B. N.

PATENTS.

Cooling apparatus [for liquids and gases]. J. H. West, Blundellsands. Eng. Pat. 125,101, 16.5.16. (Appl. 6949/16.)

The liquid, gas, or vapour to be cooled is passed through one or more upright U-pipes with limbs long in proportion to their diameter. The limbs are freely exposed to the air and are further cooled by allowing water or other cooling medium to trickle down in a thin film on the outside of the pipes. The apparatus may be used for cooling concentrated sulphuric acid and condensing nitric acid.—B. M. V.

Drying granular, pulverulent and pasty materials; Apparatus or kilns for —. H. Alexander. Leeds. Eng. Pat. 125,235, 18.4.18. (Appl. 6613/18.)

To allow for expansion of the vertical shaft of the apparatus described in Eng. Pat. 123,646 (this J., 1919, 241 A), the feeding device at the top of the shaft is carried in a bearing which allows for axial sliding as well as rotation.—B. M. V.

Drying moisture-bearing substances; Apparatus for —. J. H. Beebe, Rochester, N.Y. U.S. Pat. 1,295,259, 25.2.19. Appl., 16.8.18.

The drying chamber is provided with a perforated partition forming an air space adjoining the drying space, and another chamber containing dehydrating material in horizontal trays is connected to the air space. A fan is placed in the connecting conduit so that the same air is continuously circulated from the chamber containing the dehydrating material into the air space, and then through the drying space back to the dehydrating material.—W. F. F.

Dryer and evaporator. D. Hill and J. A. Meroney, sen., Assignors to F. E. Tiscornia, San Francisco, Cal. U.S. Pat. 1,296,519, 4.3.19. Appl., 8.10.17.

The material to be dried and evaporated is contained in a tier of horizontal trays in an externally heated oven. Warm dry air is passed between the layers from one side to the other, and is then dried and returned to the oven. Means are provided for reversing the direction of the air and for "sulphurating" it before delivery to the oven.

—W. F. F.

Dryer. G. E. Shatto, Cleveland, Ohio. U.S. Pat. 1,297,409, 18.3.19. Appl., 21.8.15.

A DRYER comprises a horizontal cylindrical shell rotating about its axis, which is slightly inclined to the horizontal. A number of longitudinal shelves project radially inwards from the shell and are inclined at such an angle that material progresses axially through the shell as it is rotated. Hot drying gas is introduced by a wide tube projecting axially into one end, and withdrawn from the shell at the other end, while the material travels through in the opposite direction.—W. F. F.

Dryer. W. E. Petty, Storm Lake, Iowa. U.S. Pat. 1,297,727, 18.3.19. Appl., 12.7.18.

The material to be dried is supported on horizontal racks in the upper part of a vertical cylindrical casing; a heating chamber in the lower part of the casing is separated from the drying chamber by a horizontal partition having an annular opening between its periphery and the wall of the casing. Part of the wall is hinged to give access to the drying compartment. The entire cylindrical surface of the casing is surrounded with an outer casing forming an annular air space which has openings at the bottom communicating with the atmosphere, and screened slots in its inner wall communicating with the drying chamber. Hot gas from the heating chamber passes around the edge of the partition into the drying chamber and is discharged from the latter by a ventilator at the top. Air enters the bottom of the annular space and passes into the drying chamber through the slots, and is discharged with the gas.—W. F. F.

Gas-heated furnaces. J. King, W. Gregson, and Taudevin and Gregson, Ltd., Sheffield. Eng. Pat. 125,278, 10.5.18. (Appl. 7832/18.)

The tendency to fracture of the upstanding tiles employed for the protection of the side passages for gas, in gas-heated furnaces of the usual construction, is obviated in the following manner. The sides of the heating chamber are composed of refractory blocks abutting on the insulating brickwork both at the sides and bottom of the furnace, but not forming part of the main or structural walls. The lower ends of the blocks are below the level of the slab floor of the furnace, while the upper ends reach to the spring of the roof of the furnace, but do not form part of the support thereof. The heating gases pass through the blocks via horizontal passages below the slab floor, continued into vertical passages leading through inclined ports into the heating chamber. The lower ends of the vertical passages are continued below the level of the horizontal passages, and serve as pockets for the reception of debris.—J. S. G. T.

Furnaces. A. Smallwood, London. Eng. Pat. 125,515, 23.4.18. (Appl. 6804/18.)

A NON-MUFFLED type of recuperative furnace in which the goods are run into the furnace on a movable carriage. Combustion chambers extend longitudinally through the body of the carriage and the partially burnt gases pass through heating flues also extending through the body of the carriage. Secondary air is preheated in a recuperative system in the crown of the furnace. Secondary air and partially burnt gases are brought together in the goods chamber at the sides of the carriage through several ports which can be regulated independently. The waste gases from the goods chamber pass through the recuperative system in the crown of the furnace and thence to the chimney. Gas for combustion is supplied either from an external source or from a fire-box or gas producer combined with the furnace.—B. M. V.

Tunnel-kiln; Continuous —. G. H. Benjamin, New York. U.S. Pat. 1,296,955, 4.3.19. Appl., 1.2.17. Renewed 16.7.18.

A TUNNEL oven through which the goods pass horizontally is provided with separate longitudinal heating chambers within and spaced from the side walls of the main chamber. The heating chambers on the opposite sides of the main chamber are connected across the top, and discharge their combustion products into a common vertical flue. Gas

and air for combustion are delivered into the bottom of each chamber. Air passes into the main chamber at the bottom of the longitudinal spaces between the heating chambers and the adjacent side walls of the main chamber, then upwards through these spaces where it is heated, and finally downwards over the goods in the chamber to a central discharge outlet in the floor.—W. F. F.

Treating air or other gases to remove excess moisture; Apparatus for —. L. Dunker, Rugby. Eng. Pat. 125,280, 18.6.18. (Appl. 10,050/18.)

Air that has been cleaned in wet cleaning apparatus, e.g. that described in Eng. Pat. 112,653 (this J., 1918, 114 A), contains too much free moisture to be safe for many purposes, e.g. cooling electrical machinery. To remove this excess moisture the air is passed through an eliminator consisting of a number of closely arranged dry baffle plates, and provided with a rotating or reciprocating shutter or a number of hinged flaps for shutting off portions of the eliminator in succession, so that accumulated water may drain off.

—B. M. V.

Air-washing apparatus. W. D. Phillips, Brooklyn, N.Y. U.S. Pat. 1,296,315, 4.3.19. Appl., 15.6.17.

A casing containing water is provided with a rotating horizontal shaft passing through it above the water and carrying spaced parallel discs dipping into the water. Each disc carries on its sides, near the edge, buckets of conical shape with flaring mouths, arranged tangentially. The air is passed through the casing. The discs may have serrated edges, the buckets being arranged between the serrations.—W. F. F.

Filter presses. W. O. Mason, Leeds. Eng. Pat. 125,304, 21.8.18. (Appl. 13,557/18.)

In filter-press plates of the type made in several sections held together by bolts, the latter are protected from the corrosive action of liquor leaking through the joints by enclosing them, at points opposite the joints, in sleeves of non-corrodible material, e.g., lead. The sleeves are of larger diameter than the bolts and are set in annular recesses cut in the material of the plates.—B. M. V.

Filter. G. Moore, Joplin, Mo. U.S. Pat. 1,296,685, 11.3.19. Appl., 11.12.14.

Liquid to be filtered passes under pressure from a supply vessel tangentially into the bottom of a filtering vessel provided with a transverse horizontal filter through which the liquid passes upwards. The top of the filtering vessel is closed, so that the enclosed body of air maintains the pressure on the filtered liquid; when the pressure in the supply chamber is reduced, the filtered liquid may pass in the reverse direction through the filtering medium to a tangential outlet passage. The space below the filter contains a buoyant solid material which under the action of the inflowing unfiltered liquid scrubs the surface of the filtering medium.—W. F. F.

[Wet] separators for the treatment of coal, clays, ores, etc. J. M. Draper, Bridgend. Eng. Pat. 125,344, 23.12.18. (Appl. 21,529/18.)

The patent relates to improvements in the upward current washing apparatus described in Eng. Pats. 1849 of 1915 and 111,826 (this J., 1915, 1196 and 1918, 45 A), the lighter material being permitted to overflow round the whole circumference of the outer vessel (thus increasing output), and the area of overflow being adjustable by a tapering collar surrounding the central feed tube, which is itself inde-

pendently adjustable as to height. The water which supplies the upward current enters at a tangent to the wall of the outer vessel, so that a gyratory as well as an upward motion is produced.

—B. M. V.

Liquid and gas contact apparatus. A. M. Webb, Charlotte, N.C. U.S. Pat. 1,293,270, 4.2.19. Appl., 19.6.18.

A FILLER unit, for gas and liquid contact towers, comprises a cylinder having a helical flange projecting from the inner wall. The flange is of less width than the radius of the cylinder, so that a continuous central opening is formed extending lengthwise through the cylinder.—B. N.

Refrigeration apparatus. E. R. Sage, Jersey City, N.J., Assignor to R. S. Broas, East Orange, N.J. U.S. Pat. 1,296,012, 4.3.19. Appl., 21.1.16.

A CONDENSING chamber is contained in the base of the apparatus, a separating chamber is mounted on the condensing chamber, and a rotary compressor on the separating chamber. Condensing tubes pass horizontally through the condensing chamber, and water circulates through them to the water jackets in the cylinder heads of the compressor. Lubricant from the compressor is collected and passes by gravity to a reservoir in the base through a pipe which terminates below the liquid level. The lubricant is returned to the compressor by a pipe from a point below the liquid level. The liquid refrigerant is withdrawn by a pipe dipping into the condenser and passes through an automatic expansion valve for use as required.—W. F. F.

[Crushing] mill. T. J. Sturtevant, Wellesley, Mass., Assignor to Sturtevant Mill Co., Harrison Square, Mass. U.S. Pat. 1,296,134, 4.3.19. Appl., 6.8.17.

A CRUSHING mill consists of a casing through which passes a horizontal rotating shaft carrying hammers which co-operate with a crushing surface. The casing is closed at top and bottom by horizontal plates, the upper plate being carried by a vertical pivot at one corner so that it may be swung open to give access to the hammers and crushing surface.

—W. F. F.

Mixing or impregnating one liquid with another; Apparatus for —. J. W. Walker, Assignor to G. L. Hogan, New York. U.S. Pat. 1,296,241, 4.3.19. Appl., 30.7.18.

AN apparatus for mixing one liquid with another, e.g., oil with water, consists of a porous material saturated with one liquid, and means, such as a pipe outlet embedded in it, for passing the other liquid through the material.—W. F. F.

Mixing-machine. F. H. Webster, Oakland, Cal., Assignor to C. L. Brown, San Francisco, Cal. U.S. Pat. 1,296,445, 4.3.19. Appl., 21.9.14.

A MIXING drum has a longitudinally corrugated shell forming cups which are provided with inclined transverse division plates extending partly across them. Alternatively, the division plates may be at right angles to the longitudinal axis of the cups but out of alignment in successive cups.—W. F. F.

Raising or forcing liquids; Method and apparatus for —. H. A. Humphrey, London, and W. J. Rusdell, Dudley, Assignors to Humphrey Gas Pump Co. U.S. Pat. 1,294,271, 11.2.19. Appl., 11.5.12.

SEE Eng. Pats. 11,818 and 13,342 of 1911; this J. 1912, 707.

Gaseous reactions under high pressure; Apparatus for carrying out —. C. Medgyes, Budapest, Hungary. U.S. Pat. 1,295,917, 4.3.19. Appl., 26.9.13.
SEE Ger. Pat. 274,538 of 1913; this J., 1914, 822.

Dryer. M. Wittenberg, Portland, and R. W. King, The Dalles, Assignors to Pacific Evaporator Co., Portland, Oreg. U.S. Pat. 1,295,946, 4.3.19, Appl., 30.6.16.
SEE Eng. Pat. 111,994 of 1917; this J., 1918, 46 A.

[Grinding] machine. Eng. Pat. 124,646. See X.

Rotary furnaces. Eng. Pat. 125,484. See X.

Desiccating fluids. U.S. Pat. 1,297,496. See XIXa.

Distilled water in power plant. Ger. Pat. 305,381. See XIXa.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal ash; Fusibility of —. W. A. Selvig, W. C. Ratliff, and A. C. Fieldner. Chem. and Met. Eng., 1919, 20, 274—276.

LABORATORY determinations of fusibility, in which the impurities are intimately mixed, are not directly comparable with the conditions existing when coal is burned in a furnace. The atmosphere in which the ash is heated is of special importance when testing ashes which contain relatively large amounts of iron, as ferric iron is readily reduced to the ferrous condition, and gives a more fusible slag than would obtain in an oxidising atmosphere. Ashes softening above 2830° F. (1555° C.) have such a low iron oxide content that the nature of the atmosphere in the furnace has little influence on the fusibility. The point taken as the softening temperature is that at which the ash, when moulded into triangular pyramids $\frac{1}{2}$ in. high with a $\frac{1}{4}$ in. base, has fused down into a spherical bead (see this J., 1919, 125 A). In general the softening temperature of coal ash from the various coal fields of the United States ranges from 1900° to 3100° F. (1040° to 1710° C.) and a classification is made for convenience into:—refractory ashes, softening above 2600° F. (1400° C.); ashes of medium fusibility, softening between 2200° F. (1200° C.) and 2600° F. (1400° C.); and easily fusible ashes softening below 2200° F. (1200° C.). Tables are given showing the average softening points of a large number of coals from the interior coal province (Great Lakes, Mississippi Valley, Texas) and of West Virginian coals. The former, with only few exceptions, have average fusibility values between 1900° F. (1040° C.) and 2200° F. (1200° C.) and different samples taken in the same mine show little variation. The low softening temperature is due to pyrites, gypsum, and calcite. The West Virginian coals include representatives of all three classes of fusibility.—C. A. K.

Pulverised coal; Use of — with special reference to its application in metallurgy. L. C. Harvey. Iron and Steel Inst., May, 1919. [Advance copy.] 73 pages.

As compared with hand-fired and hand-poked producers, at least four times the heat equivalent of coal can be delivered to open-hearth furnaces per single operator when using pulverised fuel. A central pulverising plant is advisable when a

number of furnaces are in use, but self-contained pulverising units are recommended if the coal consumption is below 20 tons per day. Combustion may be maintained with a maximum of 20% of excess air, and the ash and clinker contain less than 1% of carbon, as compared with 25–35% of carbon in the clinker from mechanically stoked grates. The conveyance of coal dust by means of an air current is condemned; it is preferable to distribute the dust into containers at the furnace. Thorough drying of the fuel is necessary for satisfactory operation as well as to enable the highest temperature of combustion to be attained. Simplicity of equipment is a feature of modern German plant, slow running grinding plant, principally of the ball and tube mill type, being used, but American practice favours the use of high-speed grinding machinery on the grounds of less power consumption. In order to avoid contamination of molten metal or other materials by coal ash, the fuel must be finely ground, so as to remain in suspension in the gaseous current, and be removed from the furnace. A degree of fineness which will ensure the passage of 95% through a sieve having 100 meshes per linear inch, and of 85% through a sieve having 200 meshes per linear inch is satisfactory in this respect. Lignite and pitch may be burned in the pulverised state, but special grinding mills must be used for the latter, and only pitch with a melting point above 150° C. can be successfully treated in this way. By means of centrifugal force, pitch can be reduced to shot of any size, and this process is more readily accomplished than direct pulverisation. A mixture of 30% of pulverised coal and 70% of fuel oil, together with a fixative to prevent the separation of the dust by settling, has been recently used as a fuel under the name of "colloidal oil."—C. A. K.

Colloidal fuels. Report of Committee of the Submarine Defence Association, New York. Gas J., 1919, 146, 195.

By admixing about 1% of a protective colloid, 30 to 40% of coal pulverised so that 95% passes a 200-mesh sieve, can be maintained in suspension in mineral oil, alone or with tar, over a period of several months. If 20% of tar also be used, the mixed fuel contains less than 50% of mineral oil, great economies of which are therefore possible. The mixture can be treated in storage, transport, and use just like oil. It was also found possible to blend coal tar with mineral oil without the formation of sediments. (See also this J., 1919, 165 B.)—H. J. H.

Steaming horizontal and inclined [gas] retorts, or "constructive distillation." H. J. Toogood. Gas J., 1919, 146, 22.

In the usual practice of continuous steaming of horizontal gas retorts, a large volume of gas containing much water vapour is evolved during the early period, and a small volume of exceedingly hot gas towards the end of the steaming. Reduction of retort temperature, choking of the ascension pipes, and low yields are among the adverse results of such conditions of evolution. Using heavy charges, good "heats," and superheated steam, the author proposes to eliminate the adverse factors by coupling retorts in widely different stages of carbonisation, seals or valves being provided in the respective ascension pipes so that by their operation in suitable manner the adverse influence of the gas from one retort is compensated by an opposite tendency on the part of the gas evolved during the same period from the partner retort. The retort mouthpieces are furnished with suitable steam jets. Considering

any pair of coupled retorts, the coal in the one is subjected to an initial "drying" process lasting two hours, both ascension pipes being opened. During the second period of four hours the coke residue in the partner retort is gently steamed, the ascension pipe of this retort being closed so that the water-gas produced passes into the first retort and aids the distillation of the coal therein. A third period of two hours' duration follows during which both ascension pipes are opened, and the temperature of the coke in the first retort is raised above normal whilst a fresh charge of coal is undergoing the "drying" process in the partner retort. In the fourth period, lasting four hours, the coke in the first retort is steamed, and the water-gas passed into the partner retort. Increased yields of gas and liquor are amongst the advantages claimed for the process.—J. S. G. T.

Carbonisation of coal in gas-works; Use of low temperatures in the —. Anderson. J. Gasbeleucht., 1919, 62, 56—59.

THE author compares the results obtained by the "coalite" process with those obtained in Dessau vertical retorts and concludes that the former process possesses no advantages to justify its adoption. The increased yields of products obtained by the introduction of steam into Glover-West continuous vertical retorts (compare Blundell, this J., 1917, 880, 1172; West, 1917, 1264; 1918, 26A) are referred to, and experiments along these lines with the Dessau retorts are advocated.

Ammonia; Increasing the yield of — in coal-distillation. F. Sommer. Stahl u. Eisen, 1919, 39, 261—266, 294—298, 349—353.

THE Kjeldahl method of determining nitrogen in coal has been found inaccurate, giving low results with Westphalian coals. In determining the distribution of nitrogen among the products of carbonisation it was found necessary to use Simmersbach and Sommer's method based on combustion with copper oxide (this J., 1916, 102). The nitrogen balance has been established for a number of typical German coals at varying temperatures and for each sample the temperature of maximum yield of ammonia was found. It always lay between 800° and 900° C.; while the corresponding yields of ammonia were from 16.5 to 20.5% reckoned on the original nitrogen of the coal, the main bulk of the nitrogen—up to 79%—remaining in the coke. The yields mentioned are not reached in normal practice, where various factors may operate adversely. The presence of steam tends to conserve ammonia—the author suggests the possible formation of a more stable hydroxide NH_4OH . A shortened time of contact with the hot charge by rapid removal of the gas to a cooler part of the plant is advantageous. These conditions are realised in the inclined chamber oven and the author sees therein an advantage over the vertical retort. The same advantage is realised by increasing the size of coke ovens and by lowering the level of the upper collecting flue so as to avoid overheating the gas leaving the ovens. Benzol as well as ammonia is thereby conserved, especially in the latter half of the distillation period when the moisture in the coal has all been evaporated. In the carbonisation of coal free oxygen is always produced and this, quite apart from any extraneous air drawn into the charge, has a powerful destructive action on the ammonia and benzol, both of which have very low ignition temperatures. It is shown that the oxidation of ammonia by air is detectable at 150° C. while at higher temperatures it is considerable. At 250° C. 5.86% of the ammonia (2.3% NH_3 in dry air) was oxidised. Moisture acts preservative, for in air saturated at 20° C. only 0.89% was oxidised. At 450° C. the

corresponding percentages of the ammonia destroyed were 12.89% in dry and 2.01% in moist air. Against the attack of oxygen, hydrogen sulphide, which is always present in distillation gases, has a marked protective action, because it is still more readily oxidised. At 100° C. 25% of the H_2S (0.26% in dry air) was oxidised and at 425° C. 95.3% of the H_2S (1.48% in dry air) was destroyed. In contrast with ammonia, the presence of moisture if anything accentuates the oxidation. The presence of moisture also conduces to the liberation of hydrogen sulphide from the coke. The ignition temperature is also low (364° C.) and thus hydrogen sulphide by its more ready reaction with the free oxygen in the crude gas conserves the ammonia and heavy hydrocarbons. The considerable amount of thiosulphate and sulphate in fresh gas liquor indicates how extensive this action may be. The moisture of the coal coked in ovens or the introduction of steam into the retort promotes this effect. The desirability of careful sealing of doors to exclude air and the avoidance of "overpulling" is apparent, for even if the oxygen is removed by the sulphur it results in the formation of corrosive acid products. The presence of steam in the charge inhibits the conversion of ammonia into hydrocyanic acid, and consequent loss of yield. The carbonisation of the coal in the wet state as in coke ovens results in a smaller production of cyanogen compounds. Methods are described for the determination of hydrogen cyanide in gas liquor and crude gas—both adaptations of Feld's methods (this J., 1903, 1068). The fresh gas liquor is neutralised with N/1 sulphuric acid, and 5 times the equivalent of N/1 lead acetate is added. The mixture is distilled carefully into 10% ammonia which is then titrated with N/10 silver nitrate. Hydrocyanic acid is washed from the crude gas by an alkaline solution of ferrous sulphate, but the tarry matter collected retains a portion if it is not carefully extracted by boiling the tarry precipitate with caustic alkali. The cyanides—now as ferrocyanide—are determined by the Feld method (*loc. cit.*).—H. J. H.

Carbonisation and by-product recovery; Some features of —. [Testing lead for saturators.] J. Thorp. Coke Oven Managers' Assoc., Apr. 26, 1919. Gas J., 1919, 146, 247—248.

THE objects of coal carbonisation—metallurgical coke, town's gas, smokeless fuel, etc.—are so divergent that there is no uniformity of practice, nor is this probable in the future. Analyses are given of samples of tar from horizontal retorts with low heats; from horizontal retorts with high heats, and from Dessau vertical retorts using the same coal; and from coke ovens. The vertical retort and low temperature tars differed from the others in having a high percentage of tar acids (10% and 14% respectively) mainly cresols. The content of free carbon and light oils was also low.

To test the quality of the lead used in the construction of saturators, 5 grms. should be heated with 0.8 c.c. of mercury to 130° F. (54° C.). Lead of good quality forms a silvery amalgam, and lead of inferior quality one with a bluish tint, while the dross is more abundant and separates badly.

The introduction of benzol recovery from coal gas is ascribed to W. Irwin, who scrubbed Manchester gas in 1881 and obtained a yield of 3 gallons per ton.—H. J. H.

Asphalt and coal. J. Marcusson. Z. angew. Chem., 1919, 32, 113—115. (See this J., 1919, 88A.) THE iodine values of coal and various asphalt products determined by Harf's method (Chem.—

Zeit., 1906, 30, 1204), using Hübl's solution, were:—Asphaltenes from Trinidad asphalt, 51; from petroleum pitch, 30; carbenes, 39; carboids, 38; and coal, 25.6. Chlorosulphonic acid compounds were prepared by shaking 1 gm. of finely powdered coal etc. with a mixture of 1 c.c. of chlorosulphonic acid and 6 c.c. of chloroform, and, after standing over-night, treating the mixture with ether to separate the excess of chlorosulphonic acid, filtering the liquid, and washing the residue first with ether and then with water. The product obtained from coal contained 1.3% chlorine and 9.1% sulphur, whilst an analogous compound from carbenes contained 1.4% Cl and 9.1% S. The calcium salts of the nitro derivatives of asphaltic substances and coal contained from 5.29 to 3.97% CaO. The fact that all asphaltic substances combine readily with sulphuric acid indicates that the oxygen and sulphur in asphaltenes, carbenes, and carboids are in ring formation. Lignite, unlike coal, contains no carboids, but waxy and resinous constituents, which, by decomposition and polymerisation and oxidation of the products of decomposition, yield carboids. The main constituents of lignites are furan resins, which differ from the furan resins of coal in having a lower molecular weight and in being more readily attacked by chemical agents. Lignite forms an addition compound with sulphuric acid, containing e.g. 5.3% S in the case of a lignite with 1.4% S. The yield calculated on the anhydrous ash-free material was 103%. Chlorosulphonic acid, sulphuric acid with ammonium persulphate, and methylal with sulphuric acid act in a similar way upon lignite and on coal. A sample of lignite had an iodine value of 42.6. A brown resin with properties analogous to those of lignite resin was obtained by the condensation of furfural with strong hydrochloric acid. All the chemical facts indicate that there is no fundamental difference between lignite and coal. The swelling up of coal when heated is due to the presence of carboids, which are not present in lignite. On mixing finely divided lignite with a small amount of carboid it swells up on heating exactly in the same way as coal. Anthracite also behaves in a similar manner to coal when treated with reagents, and yields similar compounds with sulphuric acid. The nitro derivative has a molecular equivalent of 565. The series peat, lignite, coal, and anthracite is thus analogous to the series petroleum resins, asphaltenes, carbenes, and carboids, which are all derivatives of petroleum.

—C. A. M.

Roumanian Navy fuel oil; Suitability of — as burning oil. R. von Walther. Chem.-Zeit., 1919, 43, 198.

LARGE amounts of this oil have been set free owing to the cessation of hostilities. The oil is dark brown, has sp. gr. 0.8675, and possesses a slight smell. Only a trifling reactivity is displayed to strong sulphuric acid. On distillation in an Engler flask, it gave the following fractions: 135°—175° C., 1.02; 175°—195°, 1.79; 195°—225°, 8.07; 225°—255°, 10.41; 255°—285°, 29.74; 285°—315° C., 21.28; residue, 21.79%. The specific gravities of the fractions are higher than for corresponding fractions of American and Russian oils. The distillate up to 285° C. (45% of the oil, with sp. gr. 0.840) was suitable for a burning oil and possessed good capillarity. In spite of the high sp. gr. the flame was normal. The residue from the burning oil fraction was viscous and suitable for the manufacture of lubricating oils. Cracking experiments at 15 atm. pressure showed that an increased yield of light fractions was obtainable together with a small amount of coke and a gas loss of 15%. The residue after cracking was mobile. The total

yield of burning oil from straight distillation combined with the cracking of heavy fractions was 65%.—A. E. D.

Carbon dioxide in gases. Hargreaves. See XXIII.

PATENTS.

Artificial fuels and processes for manufacturing the same. A. M. L. Arkell, Cadoston, Glam. Eng. Pat. 125,256, 9.5.18. (Appl. 7803/18.)

THE fuel is composed of a mixture of small steam coal, washery settlings, anthracite settlings, and pitch or similar bituminous substance. These are crushed, mixed with sufficient water to produce a plastic mass, and the mixture is pugged and then moulded to any desired size and shape under the least pressure necessary to obtain a firm mass. The mass retains some water, which is subsequently removed by passing the blocks through a dryer at 600°—650° F. (about 315°—340° C.), the bituminous materials then melting, serving to bind the mixture into a porous mass.—J. S. G. T.

Coke-oven door. L. Wilputte, Assignor to A. A. Wilputte, New Rochelle, N.Y. U.S. Pat. 1,296,892, 11.3.19. Appl., 12.4.18.

THE end of a coking chamber of a horizontal coke oven is formed with a groove in the face of the oven structure extending upwards from the coking chamber. The door is enclosed in a metallic frame having a rim which enters the end of the coking chamber. Flanges, projecting laterally from the sides of the rim, overlap the portions of the oven structure at the sides of the coking chamber, and the top portion of the rim, projecting inwards beyond the sides, is seated against the bottom of the groove, and is provided with a luting surface.

—B. N.

Retorts for gas production; Heating of horizontal —. H. J. Toogood, and R. Dempster and Sons, Ltd., Elland, Yorks. Eng. Pat. 125,189, 11.3.18. (Appl. 4203/18.)

HORIZONTAL or inclined gas retorts are arranged in a setting with parallel vertical heating conduits adjacent to their sides. Producer gas is generated in a furnace below and passes through a burner at the bottom of each vertical conduit, in which it is burnt while passing upwards in contact with the retort walls. Suitable openings are arranged in the setting so that both upper and lower faces of the burner openings are accessible for inspection or cleaning.—W. F. F.

[Gas] retorts. R. J. Rew, Exeter. Eng. Pat. 125,496. (Appis. 6313, 13.4.18, and 8438, 21.5.18.)

A COAL-GAS retort is provided with means for admitting highly superheated steam during or after the final stages of carbonisation as described in Eng. Pat. 124,247 (this J., 1919, 316 A), the steam being admitted to the retort from a conduit extending along the bottom. The conduit may be formed by making a channel in the floor of the retort and covering it with a porous or perforated plate, or inverted perforated channel member. The inverted member may have a longitudinal ridge containing the perforations, projecting into the retort, to avoid choking of the orifices. The channel may be provided in a channel member below the retort floor which is perforated. The steam may be superheated practically to the final carbonisation temperature by passing it through two concentric tubes projecting into the furnace.—W. F. F.

Coal-gas; Method of stripping the illuminants from and of purifying — by means of charcoal. F. Soddy, Aberdeen. Eng. Pat. 125,253, 8.5.18. (Appl. 7698/18.)

ABSORPTION of ethylene from coal-gas by charcoal at the ordinary temperature ceases when the ethylene absorbed amounts to rather more than 1% by weight of the charcoal. The volume of gas subsequently expelled by heating the charcoal is about 1000 cub. ft. per ton of charcoal, the expelled gas being composed of one-third ethylene, one-third other illuminants such as ethane and propylene, and one-third other gases. The absorption of benzene continues until the charcoal contains 10–15% of its weight of benzene. The process is best applied to coal-gas which has undergone the usual purification process for removal of hydrogen sulphide, carbon bisulphide, carbon dioxide, water vapour, tar, and ammonia. These are absorbed by the charcoal and diminish the efficiency of the charcoal as an absorbent of illuminants. Benzene should likewise be removed by a preliminary absorption by charcoal. The benzene and absorbed illuminants are subsequently completely expelled by heating the charcoal to 300°–400° C. The charcoal is employed in layers about 4" thick, and 3–5 minutes contact between gas and charcoal is ample. The process of absorption and subsequent expulsion may be either intermittent or continuous, or a combination thereof. In both processes, a short cycle with rapid heating and cooling is desirable, the deterioration of the charcoal being reduced by an occasional slower cycle with increased heating. Apparatus for carrying out the various processes is described.—J. S. G. T.

Oils; Cracking hydrocarbon —. Gasoline Corporation, New York, Assignees of C. J. Greenstreet, St. Louis, Mo., U.S.A. Eng. Pat. 115,014, 3.8.17. (Appl. 11,212/17.) Int. Conv., 17.4.17.

THE apparatus consists of several cracking units heated in a common furnace and having a common oil supply. Each unit consists of a coil of 400 ft. of 2 in. pipe, and an expansion drum on the discharge side to equalise fluctuations of pressure in the coil. The several expansion drums are connected to a common water-cooled condenser. Any uncondensed vapour passes to an absorption tower down which naphtha is made to flow, and the product is mixed with the main distillate. Oil and steam are passed under pressure into the coils, which are so heated that the oil is just about at its vaporising point when it has traversed half the total length, more steam being admitted at the mid-point. The first half of each coil thus acts as a preheater, and the second half as the cracking tube proper. The total steam admitted amounts to about one-fifth of the oil, half being supplied with the oil at the entrance to the coils and half at the mid-point. The pressure in the coils (regulated by valves between the pressure drums and the condenser) may be 80 to 125 lb. per sq. in., and the temperature 800°–1500° F. (about 420°–820° C.) according to the oil being treated. Each coil is made to deliver approximately 1733 gallons per minute. The oil to be treated may have sp. gr. 0.7795 to 0.8655. The product is a cherry-red oil which on distillation yields a colourless gasoline substitute having a substantially uniform distilling range up to 410° F. (210° C.) and a gravity range of 0.7710 to 0.7795. Any carbon formed in the coils may be removed without injury to the apparatus by blowing air and steam through the heated pipes.—T. St.

Nitro compounds; Separation of — from natural oils. S. Dreyfus, Denton, Lancs. Eng. Pat. 124,475, 19.1.16. (Appl. 849/16.)

MIXTURES of paraffins and aromatic nitro compounds, such as are obtained by the nitration of Borneo

petroleum oils, are treated with a quantity of strong sulphuric or nitric acid approximately equal in weight to the nitro compound present, and the mixture agitated at the ordinary temperature for about 10 minutes. The nitro compound dissolves in the strong acid which is finally allowed to settle, and the paraffin is then run off. The nitro compound may be made to separate from the acid by the addition of water, or the acid and nitro compound may be used direct for further nitration.—T. St.

Oils; Means for purifying and vaporising —. L. Wirtz, Birmingham. Eng. Pat. 124,895, 4.4.18. (Appl. 5816/18.)

CRUDE oil containing water which will not separate by gravity is placed in a shallow tank through which an endless belt of gauze or openwork fabric passes. After leaving the tank the oil-covered gauze is subjected to currents of air, under the influence of which the contained water is partly vaporised and partly caused to run off in drops into channels which carry it away. The belt, at a later stage, passes over a scraper and at this point is subjected to a downward current of air. The oil is thus detached from the gauze and passes through pipes to boilers or engines. Atomisation of the oil is assisted by placing gauze sleeves etc. in the conveying pipes and admitting compressed air.—T. St.

[Mineral] oil refining apparatus. H. C. Leete, Cushing, Okla. U.S. Pat. 1,288,934, 24.12.18. Appl., 24.11.17.

THE apparatus comprises a separator, two pumps, and four stills arranged in series. The hot residue (fuel oil) from the last still passes through a pipe leading to one of the pumps and serves to preheat the crude oil, which is forced by the other pump through tubes extending through the fuel oil pipe and leading to the separator. The heated crude oil enters the separator under pressure and impinges against a deflecting plate, whereby it is atomised and gasoline is liberated. From the separator the oil, freed from gasoline, passes to the stills.

[Petroleum] oils; Process of refining, fractionating, and reducing —. W. C. and F. E. Wells, Columbus, Ohio. U.S. Pat. 1,296,244, 4.3.19. Appl., 2.12.13. Renewed, 8.7.18.

CRUDE petroleum is floated on a heated non-evaporable fluid bath, and a permanent gas is passed through the bath and thence through the oil. The oil is thus evaporated to a "dry residue." The distillate is recovered by passing the gas saturated with petroleum vapours through a condenser.—T. St.

Hydrocarbons; Process and apparatus for cracking and distilling —. A. Cochran, Brooklyn, N.Y., Assignor to T. Cochran, New York. U.S. Pat. 1,296,367, 4.3.19. Appl., 8.4.16.

A CYLINDRICAL retort, containing heat-conducting metallic balls, is rotated within a furnace on hollow trunnions fixed to the two ends. The outer ends of the trunnions are closed, but apertures are provided which register with apertures in the bearings. Hydrocarbon oils with steam or water are admitted to the retort through one of the trunnions and the resulting gases and vapours pass away through the other.—T. St.

Fuel for internal-combustion engines. T. Midgley, jun., Dayton, Ohio, Assignor to The Dayton Metal Products Co. U.S. Pat. 1,296,832, 11.3.19. Appl., 7.1.18.

A FUEL for hydrocarbon engines of a predetermined compression value consists of a mixture of two hydrocarbons having compression values respectively higher and lower than the predetermined value, in suitable proportions.—T. St.

Fuel; Liquid —. A. A. Backhaus, Baltimore, Md., Assignor to U.S. Industrial Alcohol Co. U.S. Pat. 1,296,902, 11.3.19. Appl., 12.10.17.

THE fuel consists of gasoline, kerosene, and an alcohol, blended together into a homogeneous mixture by a relatively small proportion of castor oil.

—T. St.

Oil; Obtaining — from shale. F. G. Shreves, Denver, Colo. U.S. Pat. 1,297,022, 11.3.19. Appl., 25.2.18.

A RETORT contains a number of independently heated chambers each provided with a conveyor so that shale is worked forwards and downwards from upper to lower chambers, the connections being such as to prevent the passage of matter from lower to upper chambers. Above each conveyor is a vapour dome connected with a condenser.—T. St.

Lubricants; Process of treating used —. J. O. Handy, Assignor to Pittsburgh Testing Laboratory, Pittsburgh, Pa. U.S. Pat. 1,295,308, 25.2.19. Appl., 16.2.18.

USED lubricants are subjected to clarifying and decolorising treatments, and any moisture is removed by treatment with a dry dehydrating agent. The

about the same as is obtained under ordinary pressure. The yield of wood charcoal was at least 45%, as compared with about 33% in the ordinary way. Instead of the usual birch wood tar a much "milder" tar was obtained which had some of the characters of spruce wood tar, e.g., odour and solubility in caustic soda; this tar was quite suitable for the preparation of disinfectant fluids soluble in water.—J. F. B.

Estimation of methoxyl. Hewitt and Jones. See XXIII.

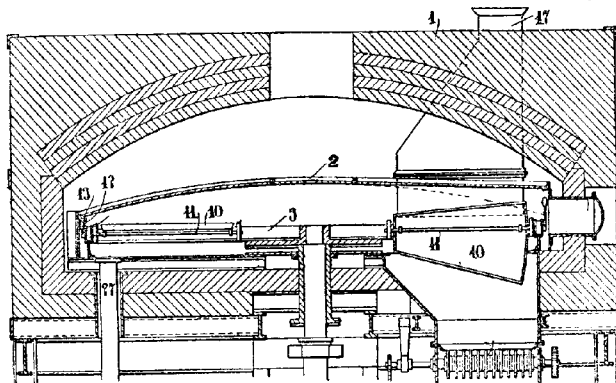
PATENTS.

Coal, shale, peat, wood and other bituminous or organic materials; Carbonisation of — and apparatus therefor. G. T. Bellby, London. Eng. Pat. 124,039, 12.3.18. (Appl. 4287/18.)

THE material is fed by a hopper, 17, into a series of shallow trays, 10, carried by a horizontal rotating frame, 3. The plane of the lower edge of the hopper is horizontal and just above the tray, so that a thin uniform layer of material is deposited on the tray. The trays are pivoted on radial arms, 11, and carry rollers, 12, bearing on a circular rail

so that when a gap is reached, the tray tips into a vertical position and discharges the carbonised material. The speed of revolution of the trays is such that the carbonisation is completed in less than a complete revolution. Each tray is brought back to its horizontal position by an upturned portion of the rail which engages with the roller. The frame carrying the trays rotates within a flat gas-tight metal casing, 2, having an outlet, 27, for the distillation products and enclosed in a heating chamber of brickwork, 1, so arranged that the heating gases pass round the upper and lower surfaces of the casing.

—W. F. F.



lubricants are afterwards treated with sulphuric acid, then with a base, and finally the base and its products are removed.—T. St.

Gas-heated furnaces. Eng. Pat. 125,258. See I.

Separator for coal. Eng. Pat. 125,344. See I.

Carbonisation. Eng. Pat. 124,039. See II B.

Distilling apparatus. U.S. Pat. 1,297,590. See III.

Hydrogen. Eng. Pats. 125,112 and 125,419. See VII.

Water-resisting admixtures for cement. Ger. Pat. 308,874. See IX.

Lampblack. Eng. Pat. 124,557. See XIII.

Detecting gases. Eng. Pat. 124,453. See XXIII.

II B.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Wood; Course of destructive distillation of — in a vacuum. O. Aschan. Finska Kemistisamfundets Meddelanden, 1918. Chem. Zentr., 1919, 90, II., 198—199.

BIRCH wood was subjected to destructive distillation under reduced pressure (6–8 mm.). The yield of acetic acid was 0.9% of the dry substance, which is

Decolourizing-carbon; Production of —. The Tai-Koo Sugar Refining Co., Ltd., London. From M. Obrembski and H. C. Resker, Victoria, Hongkong. Eng. Pat. 125,230, 16.4.18. (Appl. 6427/18.)

MATERIALS such as wood chips, sawdust, coconut husks, straw and hay, etc., are mixed with an equal weight of calcium chloride dissolved in a sufficient quantity of water to give the mixture the consistency of thin porridge, and then evaporated to dryness under vacuum. The resulting product is carbonised in retorts for 1 to 2 hours at 600°–800° C. The carbonised mass is washed, acidified with hydrochloric acid, boiled, filtered, re-washed, and finally ground.—J. S. G. T.

Charcoal from wood; Manufacture of —. A. B. Roxburgh, Monkseaton, T. Sanderson, Gosforth, and F. H. Sanderson, Felton. Eng. Pat. 125,439. (Appls. 10,439, 25.7.16, and 798, 16.1.17.)

WOOD is caused to pass by gravity through an externally heated vertical or inclined retort. The temperature of the retort increases from its upper end downwards to a maximum value, and then decreases. After subjection to the maximum temperature, the hot mass is cooled, either in the lower part of the retort, or in a separate discharge chamber out of contact with the air. This cooling

is accelerated by a current of air surrounding the cooling region, such air being subsequently utilised as a hot-air supply for the fire-chamber of the retort. Water or steam may also be employed as cooling agents. The fire-chamber is preferably heated by the distillation gases.—J. S. G. T.

Distilling oil from coal and the like. W. H. Wise, Falmouth. Eng. Pat. 125,528, 24.5.18. (Appl. 8624/18.)

COAL is distilled from the floor of a long retort of rectangular cross-section with arched roof, the maximum temperature not exceeding 450° C. The material is moved through the retort by a number of balance-weighted spades actuated in unison by a reciprocating frame. The spades are free to swing only in one direction so that on the reverse journey they pass freely over the material.

—J. S. G. T.

Rare earth [fluorides]. Ger. Pat. 310,365. See VII.

III.—TAR AND TAR PRODUCTS.

Pitches and bituminous materials, with special reference to stearine pitches. H. M. Langton. Proc. Oil and Colour Chem. Assoc., 1919, 2, No. 7. 29 pages.

THE author describes fully the characters and uses of the various pitches and bituminous materials. Methods for the examination of fat pitches are given embodying determination of ash content, specific gravity (glycerin-water or alcohol-water method), melting-point (by Mansbridge's method, this J., 1918, 1837), free fatty acids, saponification and iodine values, and solubility. Ultimate analyses, physical and chemical constants, and properties of fat pitches from whale oil fatty acids and palm oil fatty acids are given.—A. de W.

PATENTS.

[Tar, mineral, vegetable and other oils:] Distilling apparatus [for —]. J. Piette, St. Gilles, Belgium. U.S. Pat. 1,297,590, 18.3.19. Appl., 7.4.17.

AN apparatus for distilling tar, mineral, vegetable or other oils comprises a series of sets of tubes, arranged in cascade, each set in a separate chamber which is supplied with hot gas from a common furnace. Steam and oil are admitted to the first set of tubes, and steam to each successive set, and the volatile products are collected.—W. F. F.

Anthracene; Production of high percentage —. Soc. d'Eclairage, Chauffage, et Force Motrice, Paris. Eng. Pat. 119,855, 23.7.18. (Appl. 12,014/18.) Int. Conv., 23.9.17.

CRUDE anthracene is dissolved by warming it in phenol, cresol, xylenol, or similar homologues of phenol, separate or mixed. The crystals which separate on cooling are removed by filtration and washed with benzene or other organic solvent, or with an aqueous alkaline solution and then with water. The treatment may be repeated if desired, and the anthracene finally purified by crystallisation from pyridine.—L. A. C.

Tar acids or phenols; Process for extracting — from coal or wood tar or coal or wood tar oils in the distillation or vapourisation of same. H. P. Hird, Hipperholme, Yorks. Eng. Pat. 125,445, 2.8.18. (Appl. 10,885/18.)

SEPARATION of tar acids (phenol, etc.) from coal or wood tar or tar oil is effected by running or spray-

ing a solution of caustic soda into the vapours generated during the distillation of the tar or tar oil as they pass from the still to the condenser. The condensed liquid is run into a receiving tank and the sodium carbolate or cresylate sinks to the bottom.—L. A. C.

Cracking hydrocarbons. U.S. Pat. 1,296,367. See II.

Waterproof compound [from tar]. Eng. Pat. 125,492. See IX.

Lampblack. Eng. Pat. 124,557. See XIII.

Paint. U.S. Pat. 1,296,776. See XIII.

IV.—COLOURING MATTERS AND DYES.

Indican; Improved method of preparing — from indigo-yielding plants. B. M. Amin. Agric. Res. Inst. Pusa, Indigo, Pub. 5.

THE method, which is far more rapid than any of the methods hitherto described, gives an excellent yield (70–80%) and can be applied to any species of plant. By its use pure indican has, for the first time, been prepared in large quantities from Java indigo (*Indigofera arrecta*). The fresh leaves are extracted with hot water, so as to dissolve the indican, and freshly slaked lime is added to the extract to precipitate the impurities, such as amino-acids, tannins, gums, etc. After filtration the purified liquor is evaporated to a pasty syrup, from which the indican is extracted with acetone. The wet extract is evaporated to remove the acetone, and on cooling the remaining aqueous solution in ice, indican hydrate separates out. The crude hydrate is dissolved in alcohol, and from this solution, on the addition of benzene, pure anhydrous indican crystallises out.—W. G.

Curcumin. P. C. Ghosh. Chem. Soc. Trans., 1919, 115, 292–299.

AN extended study of the condensation products of curcumin with benzaldehyde and nitrosodimethyl-aniline and also of the bromo-derivatives of curcumin and its derivatives has led the author to assign a formula to curcumin identical with that suggested by Milobendzki, Kostanecki, and Lampe (this J., 1910, 1002) and subsequently confirmed by Lampe (this J., 1918, 763 A). It is shown that the acetyl derivative prepared by Jackson by the action of acetic anhydride and sodium acetate on curcumin is, in reality, diacetylisocurcumin and that isocurcumin can be obtained from it by de-acetylation by sulphuric acid in acetic acid solution. Heller's suggestion (Ber., 1918, 47, 887) that curcumin and isocurcumin are geometrical isomerides thus receives confirmation.—H. W.

PATENTS.

Dyestuffs; Preparation of monoazo —. Farbenfabr. vorm. F. Bayer und Co., Leverkusen. Ger. Pat. 309,951, 26.7.17.

AMIDES of 5-nitro-2-aminobenzene-1-carboxylic acid in which both hydrogen atoms of the amide group are replaced by alkyl or aryl groups, are diazotised and coupled in acid solution, with sulphonic acids of β -naphthylamine or its derivatives. The products dye wool from an acid bath in red to violet shades, of good fastness to milling and light, and are level dyeing. The amides may be obtained by the condensation of nitro-isatoic acid with secondary aliphatic or aromatic amines. The

methylanilide of 5-nitro-2-aminobenzene-1-carboxylic acid melts at 183°–184° C., the ethylanilide at 144°–to 145° C., the dimethylamide at 213°–214° C., the piperidide at 163°–164° C., and the ethyl-*o*-toluide at 147°–148° C.—L. L. L.

Picric acid. Eng. Pats. 16,607, 17,525, and 124,490. See XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wool; Elasticum reaction of —. W. Herbig. Z. angew. Chem., 1919, 32, 120.

The phenomena which Von Allwörden (this J., 1916, 416) found to be produced on the surface of wool by the action of chlorine water are produced in a much more pronounced fashion by saturated bromine water. The bromine stains the fibre, and thus renders the characteristic pearl-like formation on the surface much more visible. As was observed by Von Allwörden and subsequently by Naumann (this J., 1917, 706), one fibre may show the phenomenon over its whole surface, whilst an adjoining fibre may only show it in places.—C. A. M.

Cellulose acetates; Chloroform-soluble and acetone-soluble —. H. Ost. Z. angew. Chem., 1919, 32, 66–70, 76–79, 82–89.

The cellulose acetates are divided into two classes: (1) primary products of the acetylation of cellulose or hydrocellulose, which are soluble in chloroform, preferably with the addition of a little alcohol; (2) secondary acetates derived from the primary products by mild processes of hydrolysis or saponification. The primary acetates show a partial and fugitive solubility in acetone and, whilst their films from chloroform are good, those from acetone are poor and can only be partially re-dissolved by acetone. The acetone films from the secondary acetates are good and the complete solubility in acetone is a permanent characteristic. The catalysts available for acetylation fall into two groups: (1) those containing no sulphuric acid, of which class zinc chloride is the only representative studied by the author; (2) sulphuric acid or dissociable compounds capable of liberating sulphuric acid, such as the sulphates of organic bases. A suitable acetylating mixture of the first group consists of 40–50 grms. of acetic anhydride, 40–50 of glacial acetic acid, and 5–10 of fused zinc chloride for 10 grms. of cellulose. Acetylation with this mixture at the ordinary temperature (10°–20° C.) requires from 3 weeks to 3 months and yields primary products of good quality having a composition corresponding closely with that of cellulose triacetate. The process may be shortened to 8–24 hours by performing the acetylation at 60°–70° C., but at this temperature there is a considerable breakdown of the cellulose molecule and the films are of little value. All these preparations are infusible at 250° C. In acetylation with sulphuric acid suitable proportions of the catalyst range from 5 to 10% of the weight of the cellulose. In no case is the primary product free from sulphuric acid in organic combination with the cellulose. Nevertheless, the amount of combined sulphuric acid is very variable, depending on the composition of the acetylating mixture and the time and temperature of the acetylation. It would appear that the more prolonged the acetylating reaction at a low temperature, the more complete is the displacement of the combined sulphuric acid by the acetyl radical, but the risk of damage to the cellulose molecule by acetylation is greater. With 5–10% of sulphuric acid, the time of acetylation may extend to 2–4 days at 10° C. With methylamine sulphate, in the

proportion of 5–10% of the cellulose, the time of acetylation may be prolonged to 6 or 9 days and the temperature raised to 35° C.; at 65°–70° C. acetylation is complete in 3 hours but a prolongation of the time at this elevated temperature leads to the destruction of the cellulose. The percentage of combined sulphuric acid in the primary acetates prepared with methylamine sulphate is considerably higher than that in corresponding acetates prepared with free sulphuric acid; it is generally over 1% and sometimes over 3%. When the quantity of sulphuric acid in the acetylating mixture is reduced to a minimum, *e.g.* 1–2% on the cellulose, acetylation may be smoothly effected at 35°–40° C. in a few hours. With these small quantities of catalyst the best results are obtained by steeping the cotton in an excess of an acetic acid solution of sulphuric acid and pressing out to the required limit. Even with a total quantity of only 1% of sulphuric acid on the cellulose, the primary acetate still contains substantial proportions of combined sulphuric acid. All the above trials were made with a large excess of acetic anhydride equal to 4–5 times the weight of the cellulose. When the amount of anhydride was reduced to 2.4–3 times the weight of the cellulose, products of ill-defined composition containing large percentages of combined sulphuric acid were obtained; nevertheless these approximated more to the normal acetates, but with a breakdown of the cellulose, when the time of acetylation was prolonged to about 4 days at 20° C. These mixed acetates, however, when prepared at low temperatures with a short time of acetylation, are well suited, on account of the ease with which they undergo saponification, for the preparation of modified secondary acetates soluble in acetone. Primary acetates prepared from previously hydrolysed cellulose differ in no essential respect from those prepared from ordinary cellulose; the films are apparently just as good, but the solutions have generally a lower viscosity and the precipitated products are more pulverulent. Hydrocellulose, however, is acetylated more easily than cellulose, the acetylation proceeding more rapidly, with smaller quantities of catalyst and at a lower temperature. Secondary acetates, permanently soluble in acetone, are produced by a modification of the primary acetates by various processes, which substantially amount to a regulated saponification by acid hydrolysis. In all cases this modification takes place with the elimination of a portion of the combined acetic acid and the whole or the greater part of the combined sulphuric acid. At the same time the optical *lavo*-rotation of the primary acetate is considerably reduced and the melting point may be lowered. According to Bayer's Ger. Pat. 252,706, the primary acetylation is performed with 15% sulphuric acid and a restricted quantity of acetic anhydride. The primary products obtained by acetylation for a short time (1 day) at a low temperature retain much combined sulphuric acid (over 3%). If acetylation be allowed to proceed for a longer time, the combined acetic acid increases and the sulphuric acid decreases; but this takes place with a profound breakdown of the cellulose. According to the patent a little water is added to the primary syrup and the solution is allowed to "ripen." In this process there is no breakdown of the cellulose and the viscosity of the syrups is maintained. The percentage of combined acetic acid shows a progressive decrease during the ripening and that of the combined sulphuric acid falls to 0.25% after 1–2 days and to 0.17% after 4 days. The acetic acid values, for instance, showed 57.4% after 1 day, 54.0% after 2 days, 50.9% after 4 days at 20°–23° C., all these secondary acetates being soluble in acetone and giving good films. A method which gives secondary acetates of best quality consists in heating the primary acetates, or the primary syrups after neutralisation of the

sulphuric acid, with 95% acetic acid at 98° C. for many hours. Saponification takes place in the same manner as above, the range of complete solubility in acetone corresponding with a period of heating from 24 to 96 hours and an acetic acid value between 56.2 and 50.8%. Heating in the presence of small quantities of catalysts, such as sodium bisulphate, leads to a similar result; heating with aniline or with phenol also brings about partial saponification and conversion into the acetone-soluble modification. In the case of phenol a little water must be present; the same remark applies when glacial acetic acid is employed; the necessary saponification does not occur in the absence of water. The limits of solubility in acetone show a fairly wide range, between 57.6 and 50.9% of combined acetic acid, nevertheless it is not every kind of saponification which leads to solubility in acetone and it must therefore be inferred that the different hydroxyl groups of cellulose are not all equivalent in this respect.

—J. F. B.

Paper-pulp in Australia; Possibilities of manufacture of —. G. Lightfoot. Commonwealth of Australia, Advisory Council of Sci. and Ind., Bull. No. 11, 1919. 37 pages.

THE various studies which have been made in connection with the production of paper pulp in Australia are summarised and discussed in their technical and economic aspects. So far as wood pulp is concerned a serious difficulty is that, in the main, the Australian forests are mixed as regards species and the costs of collection and transport are high. Of four Tasmanian species investigated, the "stringy bark" showed the best results for yield by the soda process, but at the time of the investigation the economic factors could not be regarded as favourable to the establishment of a wood pulp industry with Tasmanian trees. The only successful attempt hitherto made to produce wood pulp in Australia on a commercial scale is that of the Queensland Pine Co., treating hoop and bunya pines by the soda-sulphate process, but this undertaking is only on a limited scale, and as a subsidiary operation to the lumber business, in order to utilise the lumbering waste and the saw-mill off-cuts. There is, however, a possibility of extending the manufacture of pulp from these sources, using "thinnings" from Government plantations and knotty pine tops, which are at present discarded, and of which about 20,000 tons are available per annum within transportable distance from a pulping centre. Another species which deserves attention and which grows rapidly is the candlenut (*Aleurites moluccana*); this wood appears to be equal to poplar for general purposes. In New South Wales a number of tests have been undertaken and a species of mountain gum (*Eucalyptus goniacalyx*) appears to be of interest. Various proposals to utilise the woods of certain "mixed" forests and scrubs in the neighbourhood of abundant water supply and cheap power have been discussed. In Victoria certain species of eucalyptus ("mountain ash" and silver top) were at one time worked in a paper mill. These woods are abundant in Eastern Gippsland and might be developed. In S. Australia the "remarkable pine" (*P. insignis*) is planted in considerable quantities. Water supply and transport are not favourable, but good rail facilities exist in the neighbourhood of the forests. This pine grows well and matures in 20–25 years, and this reserve of timber capable of serving for the manufacture of pulp by the sulphate process is likely to be extended. In W. Australia tests have been carried out on certain eucalyptus species, from which it would appear that superior results are obtained in the case of Tasmanian "blue gum" if

the trees are cut in an immature stage. Similar remarks apply to "Karri" timber, wood from 8-year-old trees being very much superior in yield and consumption of soda to logs from older trees. "Karri" would appear to be well worth a systematic development in 8-year cycles. A survey of the whole question reveals no material of sufficient uniformity of growth and quality to serve for the manufacture of mechanical wood pulp, and experiments have been carried out on the planting of the Norwegian spruce. The results are not as yet conclusive, but it is possible that a profitable planting of pulp spruce might be established in the mountainous parts of Victoria and Tasmania. As regards materials other than wood, investigations have been made with "blady grass" or lalang, nauram grass, and bamboo grass, the results of which are not quite conclusive. A sedge (*Galmita decomposita*) which is abundant in the "Karri" timber-growing districts of W. Australia, has been found to be very suitable for the manufacture of pulp for blending with the "karri" pulp. Lastly, reference is made to the proposal for establishing the manufacture of pulp from cereal straw in S. Australia (this J., 1917, 27).—J. F. B.

Soda pulp manufacture. E. Sutermeister. Pulp and Paper Mag., 1919, 17, 215–218, 243–246, 263–264, 289–292, 309–314, 327–330, 351–354, 375–378.

THE author deals comprehensively with the manufacture of wood pulp by the soda process, describing in detail the preparation of the cooking liquor (caustic soda solution), the cooking operation, practice at various mills with data relative to the types of wood employed, by-products of cooking, types of digesters used, washing the pulp, black liquor and its treatment, and treatment of the fibre prior to bleaching.

[Wood] pulp; Testing moisture in —. E. B. Slack. Techn. Committee Canadian Paper and Pulp Assoc. Pulp and Paper Mag., 1919, 17, 265–270.

IN an earlier report, the method recommended for sampling wet lap pulp was to cut a strip 3 in. wide the full length of the sheet. The accuracy of this method has been verified by taking the strip sample cut clean across the face of the roll and comparing it with the remainder of the lap. Average of strip method, 39.79% of air dry pulp; average of whole lap, 39.82%. The same method has been applied to the testing of pulp made into sheets on Rogers' wet machine: average of strips, 46.58%; average of whole sheets, 46.68%. In the case of hydraulic pressed pulp in laps the strip method has been compared with the wedge method, with the result that the wedge method has been found to be far more accurate. In this case 2-in. strips were cut from the centre of the lap to the outer edge, the cut portions forming a cross in every four samples. Results: wedge method, 54.39%; entire lap, 53.78%; strip method, 55.23%; entire lap, 54.11%. Another series of tests was carried out with pulp run over drying cylinders and made up in rolls about 18 in. in diameter. Three rolls are made from the machine roll which is slit direct from the dryers. The method employed is to cut a strip 3 in. wide across the face of each roll as it is made up and collect these strips in an air-tight box. This method has been tested by cutting strips from 19 other layers of the same roll after cutting it through to the core. Average results from top layer strips, 71.80%; average of 19 other layers, 71.90%. The above method serves to establish the correct quantity of air-dry pulp in the roll, but of course would not be suitable for sampling rolls which have been in transit or store.

For testing such rolls, the following procedure is advised: A test strip 3 in. wide is taken across the face of the roll from the second layer and four other similar strips from layers situated at least 1½ in. or further from the outside layer. Trials made by this method have shown very consistent results.—J. F. B.

Paper sizing. O. Aschan. Meddelanden från Industrins Centrallab., 1917, Nr. 4. Chem. Zentr., 1919, 90, II., 190.

In the sizing of paper with rosin size and alum, as much as two-thirds of the weight of the alum may be lost in the back-water. The running of the stuff on the machine with circulation of the back-water is an important factor in obtaining resistance to ink. The sizing deposit itself consists of a mixture of aluminium resinate with free resin acids which can be extracted with ether; there is also a small amount of free aluminium hydroxide. An excess of free resin acid is not an effective substitute for a deficiency of aluminium resinate. Experiments made with resinate precipitates without the presence of paper fibre indicated that ferric and chromium salts could probably be used to produce sizing effects, and certainly aluminium sulphate containing iron salts as an impurity is a useful sizing agent. The percentage of free resin acids in the sized paper appears to stand in definite relation-ship to the total alumina in the ash.—J. F. B.

Chrysalis fat. Tagliani. See XII.

Decomposition of cellulose. Hutchinson and Clayton. See XVI.

PATENTS.

Impregnation of [balloon] fabrics or materials. Impregnation and coating of fabrics and the like. J. H. Mandleberg, and J. Mandleberg and Co., Manchester. Eng. Pats. (A) 124,494 and (B) 124,495, 5.2.16. (Appls. 1755 and 1756/16.)

(A) To increase the impermeability to hydrogen or other gas of fabrics used in the manufacture of balloons etc. the uncoated side of the fabric is impregnated with petroleum jelly or soft paraffin. (B) A mixture of rubber, ceresin wax, litharge, and sulphur is worked on the rolls until the nerve or texture of the rubber is wholly or partially destroyed. The fabric is impregnated or coated with this composition dissolved in a suitable solvent, dried, and vulcanised at 285°–295° F. (140°–146° C.). The finished material may be coated with petroleum jelly as in (A).—L. L. L.

[Coating] fabrics used in the manufacture of balloons and dirigible airships. R. T. Glazebrook, Teddington, W. M. Rouse, London, and A. Johnston, Edinburgh. Eng. Pat. 124,520, 3.3.16. (Appl. 3217/16.)

The coating consists of gelatin, in place of, or in addition to, the layers or coatings of rubber, oil, cellulose preparations, etc. The gelatin is used alone in separate sheets applied as a lining, or placed between plies of fabric, or compounded with pigments, or with dyeing materials, and preferably treated so as to render it insoluble. The loss of hydrogen through the fabric is reduced to a negligible quantity, and deterioration of the fabric by the action of light and moisture is greatly retarded by the use of gelatin.—L. L. L.

Cellulose; Digesters for use in the manufacture of — and like operations. E. Schaufelberger, London. Eng. Pat. 124,676, 27.9.18. (Appl. 15,772/18.)

In vertical stationary cellulose digesters the circulation of the liquid is arranged so that it takes place mainly in an upward direction through the charge, but to a minor extent, in the upper part of the digester, the liquid flows downward to the outlet, thus ensuring the efficient digestion of the upper part of the charge. Circulation is effected by means of an external centrifugal pump, which discharges most of the liquor into the bottom of the digester and at the same time delivers a certain proportion to a circular distributing pipe situated in the top of the digester. The liquor flows to a main outlet in the upper portion of the digester, connected with the suction orifice of the circulating pump.—J. F. B.

Resins, fats, and oils from cellulose, wood pulp, and paper pulp; Process of extracting —. O. Brune. Ger. Pat. 310,554, 22.5.17.

The material suspended in liquid is subjected to the action of a finely divided stream of compressed air or gas, forced in from the bottom of the container. The separation of the resin and fat is then effected by raising the level of the liquor in the container so that the surface layer carrying the separated resin and fat overflows.—S. S. A.

Leather imitations, felt, and Japanese paper; Process of making products having closed structures, such as —. J. Foltzer, Horn, Switzerland. U.S. Pat. 1,295,148, 25.2.19. Appl., 30.8.16.

A CELLULOSE solution is applied to a web of felted fibres, the application being heavier at intervals than at intermediate portions of the web, and the cellulose is afterwards hardened.—L. L. L.

Plastic composition and method of preparing the same. H. A. Levey, New Orleans, La. U.S. Pat. 1,295,533, 25.2.19. Appl., 10.4.17.

CELLULOSE acetate (85 parts) is mixed with China wood (tung) oil (3 parts) and cellulose nitrate (12 parts), and the mixture is dried or hardened at a temperature sufficient partially to oxidise or polymerise the tung oil.—L. L. L.

Paper; Manufacture of — [of increased combustibility]. C. R. Harrison and W. Bacon, London. Eng. Pat. 124,516, 29.2.16. (Appl. 3012/16.)

In order to increase the combustibility of paper to facilitate the destruction of documents, books, and the like, nitrocellulose, guncotton, or nitro-starch is incorporated with the ordinary fibre stock in the beater, in proportions which may vary according to the degree of combustibility desired. In the case of masses of sheets a more rapid combustibility may be imparted to the paper containing nitrocellulose by incorporating insoluble compounds of calcium or magnesium, e.g. the carbonates, whereby access of oxygen to the mass of sheets is facilitated.—J. F. B.

Paper; Waterproof —. K. Konagai, Tokyo. Eng. Pat. 124,689, 22.11.18. (Appl. 19,203/18.)

PAPER is painted with a vegetable paste, preferably bracken paste, and immersed in a gelatin solution until completely impregnated. It is then coated with a mixture of chrome alum and ammonia solution to render the gelatin insoluble. The prepared paper is subsequently painted with a first coat consisting of a mixture of 5 parts of castor oil with

5 of lead oxide which has been boiled and mixed with 40 parts of tung oil, heated for about 1 hour below 200° F. (93.5° C.), treated with 5 parts of iron oxide, and again heated for about $\frac{1}{2}$ hour. Afterwards, the paper is painted with a second coat prepared by mixing 5 parts of castor oil with 5 of white lead, heating for $\frac{1}{2}$ hour below 200° F., adding to the mixture 10 parts of zinc oxide, 20 of tung oil, and 15 of boiled linseed oil, and subsequently heating for about 2 hours. Both these paints may be thinned with pine oil.—J. F. B.

Parchmentised paper, "vulcanised fibre," and the like; Manufacture of —. The Manchester Oxide Co., Ltd., R. H. Clayton, J. Huebner, and H. E. Williams, Manchester. Eng. Pat. 124,979, 27.6.18. (Appl. 10,568/18.)

PAPER is passed through a bath of thiocyanate solution at 130° C., washed, and dried. By treating several sheets simultaneously and pressing together, "vulcanised fibre" may be produced. Suitable baths are a solution of calcium thiocyanate of b.pt. 157° C., the paper being in contact with the heated solution for about 30 seconds; a solution in the proportion of 1 part of mercuric thiocyanate to 2 of magnesium thiocyanate, at a concentration such that the boiling point is 145° C., the paper being in contact with the liquid for 15 seconds; or a solution of equal parts of calcium thiocyanate and calcium chloride having a boiling point of 157° C. The baths may be acidified by the addition of 4% of acetic acid by volume.—J. F. B.

Paper-making machine. G. McAulay, Rumford Falls, Me., Assignor to International Paper Co. U.S. Pat. 1,296,299, 4.3.19. Appl., 7.12.17.

A SUCTION-BOX is fitted transversely under a traveling belt which supports the pulp layer, and is fixed at one end whilst the other end is arranged to move periodically in the direction of travel of the belt.—S. S. A.

Paper-making machine. J. H. Le Roy and R. G. Repman, Shawano, Wis. U.S. Pat. 1,297,192, 11.3.19. Appl., 18.9.18.

A PAPER machine is provided with upper and lower couch rolls, upper and lower press rolls, a drying cylinder, a pressure roll below the dryer, a suction roll, and a single endless felt passing between the couch rolls and the press rolls, between the pressure roll and the drying cylinder and also engaging the suction roll.—J. F. B.

Canvas or other ground or surface for receiving an impression in one or more colours; Process for preparing —. J. A. D. Leurquin, Brussels. Eng. Pat. 124,843, 23.10.16. (Appl. 15,059/16.)

CANVAS or other surface is coated with successive coats of compositions of pigments ground with linseed oil and mixed with thickened linseed oil, each coat being dried and subjected to a pouncing operation before the application of the next coat. In each of the successive coats there is employed an increasing proportion of thickened oil and an increasing proportion of volatile diluent, such as naphtha. Suitable compositions are: First coat, powdered pigments, 40 parts; natural oil, 10; thickened oil, 20; volatile diluent, 10; drier, 1 part. Second coat, pigments 46; natural oil, 14; thickened oil, 30; volatile diluent, 20; drier, 1 part. Third coat, pigments, 46; natural oil, 14; thickened oil, 40; volatile diluent, 186; drier, 1 part. Amber oil may be mixed with the last coat to modify the colour.—J. F. B.

Rattan, etc.; Process for removing natural enamel from the surface of —. A. Franck-Phillipson, Chicago, Ill. U.S. Pat. 1,296,553, 4.3.19. Appl., 31.5.16. Renewed 25.1.19.

THE material is treated with a solution of an alkaline hydroxide containing sodium silicate.—S. S. A.

Lignin; Method of precipitating — from waste sulphite liquor. I. Sörraas, Aalvik, Norway. U.S. Pat. 1,297,028, 11.3.19. Appl., 24.9.17.

THE liquor is heated by indirect heating to a temperature somewhat below the precipitation temperature of the lignin substance, and is then transferred to a second vessel where it is further heated by direct heating to a temperature sufficient to cause the lignin to be precipitated.—T. St.

Silk fibres; Process for treating [degumming] —. T. Muto, Kobe, Assignor to Kanegafuchi Boseki Kabushiki Kwaisha, Tokyo-Fu, Japan. U.S. Pat. 1,296,601, 4.3.19. Appl., 25.4.17.

SEE Eng. Pat. 106,503 of 1917; this J., 1917, 959.

Cellulose acetates; Process of transforming —. H. Dreyfus, Basle, Switzerland. U.S. Pat. 1,286,172, 26.11.18. Appl., 21.1.16.

SEE Addition of 7.7.11 to Fr. Pat. 432,046 of 1911; this J., 1912, 225.

Cellulose esters with over 20% of bound fatty acid; Process for making —. A. Polotsky, Assignor to Deutsche Gasglühlicht-A.-G. (Auerger.), Berlin. U.S. Pat. 1,295,847, 11.3.19. Appl., 8.2.15.

SEE Eng. Pat. 75 of 1915; this J., 1916, 39.

Electrical conductors embedded in cellulose. Ger. Pat. 398,016. See XI.

Dopes. Eng. Pat. 124,515. See XIII.

Dissolving shellac. Eng. Pat. 124,684. See XIII.

Cellulose acetate varnishes. Eng. Pat. 124,807. See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Cotton textiles; Bleaching of — with warm hypochlorite solutions. M. Freiherger. Färber-Zeit., 1919, 30, 77—80.

IN a continuous bleaching system where the goods are progressively moved forward through the baths, which are themselves also kept in motion in counter-current circulation, the necessary acceleration of the action of the liquor is obtained by raising the temperature short of the point where spontaneous decomposition of the hypochlorite sets in. The choice of the hypochlorite employed, calcium or sodium, is important, and the influence of the temperature on the dissociation constant is different according to whether the solution is neutral, acid, or alkaline. Dilute, warm calcium hypochlorite solutions have a more energetic action than sodium hypochlorite solutions prepared by the action of sodium carbonate on calcium hypochlorite solutions. The action of warm electrolytic sodium hypochlorite solutions, owing to the absence of excess of alkali, is probably at least as rapid as that of calcium hypochlorite. Using a solution of sodium hypochlorite prepared by double decomposi-

tion, cotton goods bleached warm show a purer white than corresponding goods bleached cold, not only at the time of bleaching but even after a period of 8 years. The drawbacks generally associated with the use of calcium hypochlorite liquors are minimised when the liquors are used warm, first because the calcium carbonate is not deposited as a crust but as a loose powder, and secondly because the liquors are employed at a much higher dilution than in cold bleaching and mechanical circulation is essential.—J. F. B.

PATENTS.

Dyeing red fox skins to silver fox shade; Process for —. A. Woiskoff, Berlin. Ger. Pat. 310,425, 5.5.18.

The skin is treated on the surface first with a mixture of weak milk of lime with ferrous sulphate and alum, then with ferrous sulphate solution alone. A solution of ferrous sulphate, ammonium chloride, and potash mixed with litharge and argol is then beaten into the skin, which is afterwards treated first superficially with an infusion of burnt nut-gall to dye the end portions or surface of the long wool or hair, and then more thoroughly with a weaker infusion of nut-gall in order to dye the under or lower portion of the hair. At the end of the third stage the skin has completely lost its red tone and appears of a pale yellow shade.—L. L. L.

Fabrics having the property of invisibility; Production of [printed] —. F. Cochrane, Cheadle Hulme. Eng. Pat. 125,093, 8.5.16. (Appl. 6587/16.)

The fabric is padded in a solution of a dyestuff which will produce two or more colours by after-treatment with metallic salts. Thus, cotton, woollen or other material is padded in a cold solution of logwood, sumac, or fustic, and a uniform ground colour is then developed by passing the fabric through a boiling bath of an aluminium salt. The second colour is developed in patches on the ground colour by the application of other metallic salts such as potassium bichromate or iron salts. The fabric is folded and allowed to stand so that the patches may spread and mark off on the ground colour, and is finally dried at a high temperature further to develop and to fix the colours.—S. S. A.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitrous acid and nitrites; Determination of —. J. S. Laird and T. C. Simpson. J. Amer. Chem. Soc., 1919, 41, 524–531.

The volumetric methods described in the literature for the estimation of nitrites are unsatisfactory. The following method gives reliable results. The nitrite solution is run into an excess of standard permanganate acidified with sulphuric acid (1:4), with constant shaking. The excess permanganate is reduced by the addition of an excess of standard ferrous sulphate, sodium oxalate, or hydrogen peroxide, and the excess of reducing agent titrated with potassium permanganate. The estimation is not affected by moderate amounts of chloride or small amounts of bromide. Silver nitrite is not a satisfactory material for use as a standard in nitrite estimations. Sodium nitrite solution titrated with potassium permanganate by the method described above is a satisfactory standard solution, or sodium nitrite solution may be standardised gravimetrically by the reduction of silver bromate to silver bromide by Busvold's method (this J., 1914, 104).—J. F. S.

Boric acid; Selection of an indicator for use in the acidimetric titration of —. J. Prescher. Z. Unters. Nahr. Genussm., 1918, 36, 283–286.

For the titration of boric acid in a solution containing glycerol or mannitol, the most suitable indicator is phenolphthalein.—W. P. S.

Ammonium nitrate; Effecting and controlling crystallisation of —. J. E. Bolling. Chem. and Met. Eng., 1919, 20, 401–405.

THE ammonium nitrate liquor leaves the filter presses at a temperature not lower than 64° C., and is slightly cooled in the dilution tank. The temperature is then reduced to about 35° C. by passing through a battery of double pipes comprising a 2-in. inside pipe for cooling water, enclosed in a 3-in. pipe through which the liquor is passed; a metal spiral is wound round the inner pipe so as nearly to fill the annular space. Each unit is provided with two batteries of pre-coolers consisting of five "banks" and a spare "bank." The cooling water is used at a temperature above that of the water in the mains, and therefore a large proportion is recirculated, the small quantity of cooler water required being introduced from the mains through a three-way tap automatically regulated to maintain a temperature which will prevent crystallisation in the pipes. To this end also, the flow of the cooling water is controlled by thermostats placed in the liquor outlets. From the pre-cooler the liquor is delivered through looped pipes into an equalising tank, and when it is necessary to interrupt the delivery to the crystallisers, the liquor is rapidly circulated by independent pumps from the equalising tank, through the looped pipes, and back to the tank, sufficient hot liquor being added from the dilution tank to maintain the circuit above the crystallising temperature. If necessary, the system can be rapidly drained. The air in the pre-cooler room is circulated by means of a fan, and a regulated proportion of outside air is introduced to maintain the temperature at 90° F. (32° C.). The crystalliser plant comprises two units, each consisting of four rooms containing 480 pans, each of 40 cub. ft. capacity, and the air supply per minute for the complete installation is 600,000 cub. ft. The liquor run into the pans in the crystallising rooms is diluted with distilled water to prevent crystallisation of sodium nitrate and sodium sulphate. To minimise evaporation and thereby prevent excessive surface cooling, a vapour pressure is maintained in the room with a dew point of 35° F. (1.7° C.) and a dry bulb temperature of 45° F. (7.2° C.). Each unit of the crystallising plant is provided with two ammonia compressors, which are connected to operate independently or separately. The apparatus supplies cold brine to dehumidifiers where it is sprayed into a mist chamber through which air is drawn. The temperature and humidity of the air leaving the dehumidifiers is regulated by thermostats. The author describes in some detail the operation of the refrigeration plant and the precautions necessary to ensure uniform distribution of air in the crystallising rooms.—S. S. A.

Polyhalite; Occurrence of — in the older Zechstein potassium salt deposits in relation to van't Hoff's conclusions. M. Rosza. Z. anorg. Chem., 1919, 105, 167–170.

THE author discusses the occurrence of polyhalite, $\text{Ca}_2\text{K}_2\text{Mg}(\text{SO}_4)_6 \cdot 2\text{H}_2\text{O}$, in different parts of the salt deposits, and shows that the facts are in good agreement with what was to be expected from the work of van't Hoff. Besides being found as a primary deposit, it also occurs as a secondary formation, the result of the metamorphosis of other deposits. In some cases the polyhalite itself has been decomposed and can only be recognised by its

transformation products, anhydrite, kieserite, sylvinite, and carnallite, formed through infiltration of liquors rich in magnesium chloride. (See also J. Chem. Soc., June, 1919.)—E. H. R.

Javel extracts [alkali hypochlorite solutions]; Stability of —. Fonze-Diacon. Bull. Soc. Chim., 1919, 25, 206–208.

ALKALI hypochlorite solutions, containing 5 grms. of active chlorine per 100 c.c., lose very little of their activity during four months, if stored in bottles of dark yellow glass, even when exposed to light. In clear bottles the loss is very marked, alkali hypochlorite solutions of varying strengths tending towards a common limit of about 1 gm. of active chlorine per 100 c.c.—W. G.

Lime burning in a gas-fired continuous kiln. W. D. Mount. Chem. and Met. Eng., 1919, 20, 428–430.

THE kiln is of the shaft type, 8 ft. in diam. inside the brickwork, and 60 ft. in height to the charging floor. The limestone is charged in batches of 1000 lb. at intervals of 15 mins., the production being at the rate of 25 tons per 24 hours. The ratio of coal to lime is 1 to 5 or 6 according to the quality of the coal. The charge is fired by producer-gas made from bituminous coal low in sulphur. The gas is passed through water-cooled balanced valves, and is introduced into the kiln at the top of the cooling zone, through tuyères designed to give even distribution of the gas through the mass of limestone. Induced draught is used as it is independent of the height of the kiln and the size of the limestone blocks, and is easily controlled. The kiln is operated so as to be cold at the top and bottom, and the temperature of the intermediate burning zone is carefully controlled by a pyrometer. To prevent "dead burning" and to utilise fully the heat of the gases, the rate of passage of the limestone through the reaction zone should be regulated according to the size of the limestone blocks fed to the kiln, the amount of preheating of the charge before it reaches the reaction zone, and the nature of the fire. Emphasis is laid on the importance of the kiln being so designed as to facilitate chemical and mechanical control and mechanical continuity of the process.—S. S. A.

Isotungstic acid; Existence of —. P. Barbe. Monit. Scient., 1919, 63, 73–75.

DURING several years' work on tungsten the author has never met with a specimen of the metal having a higher atomic weight than 184, and doubts the existence of neotungsten as described by Gerber (see this J., 1917, 1181). Further, isotungstic acid does not appear to exist, and the ammonium isotungstate obtained by Gerber was actually ammonium sodium tungstate. (See also J. Chem. Soc., June, 1919.)—W. P. S.

Carbon oxysulphide; Attempted synthesis of —. F. González and E. Moles. Anal. Fís. Quím., 1919, 17, 55–59.

PURE carbon monoxide was passed over the surface of sulphur heated to 110° and 260° C. in a sealed apparatus and the gas mixture formed subjected to the action of the electric spark. No formation of carbon oxysulphide was observed.—W. S. M.

Radium emanation; Chemical action produced by —. I. Combination of hydrogen and oxygen. S. C. Lind. J. Amer. Chem. Soc., 1919, 41, 531–551.

THE velocity of combination of hydrogen and oxygen under the influence of radium emanation is

the same in spherical and cylindrical vessels; it depends only on the quantity of emanation and the gaseous pressure. The velocity constant is decreased by increasing the volume of the vessel. Excess of oxygen increases the velocity, the increase becoming greater the greater the excess of oxygen. An excess of hydrogen has the opposite effect. For each pair of ions produced 3.9 mols. of water are formed. (See also J. Chem. Soc., June, 1919.)—J. F. S.

Radium emanation; Chemical action produced by —. II. Chemical effect of recoil atoms. S. C. Lind. J. Amer. Chem. Soc., 1919, 41, 551–559.

THE action of radium emanation in causing the combination of hydrogen and oxygen in spheres of small volume is 6–7 times greater than the normal value. This is due to the ionisation caused by the recoil atoms. (See also J. Chem. Soc., June, 1919.)—J. F. S.

Double salts and complex salts; Cryoscopic investigation of — in aqueous solution. E. Cornec and G. Urbain. Bull. Soc. Chim., 1919, 25, 131–136.

A DETERMINATION of the lowering of the freezing-point of a solution of two salts together in water gives an indication of the formation of a double salt. A difference between the values observed and calculated indicates the existence of a double salt in solution, and this difference is at its maximum when the two salts are present in the molecular proportions in which they occur in the double salt itself. The cases studied were cadmium iodide and the alkali iodides, cadmium bromide and alkali bromides, and cadmium chloride and alkali chlorides.—W. G.

Selenium; Colloidal —. J. Meyer. Z. Elektrochem., 1919, 25, 80–82.

COLLOIDAL selenium is obtained by the action of dilute sulphuric acid on very dilute solutions of sodium selenosulphate: $\text{Na}_2\text{SeSO}_3 + \text{H}_2\text{SO}_4 = \text{Se} + \text{SO}_2 + \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$. The solutions are orange-yellow to dark red in colour and on filtration through a Zsigmondy ultra-filter give colourless solutions which are very stable. (See also J. Chem. Soc., June, 1919.)—J. F. S.

Temperature coefficients of catalysed and non-catalysed reactions. N. R. Dhar. Ann. Chim., 1919 [ix], 11, 130–223.

A MORE detailed account of work already published. (See Trans. Chem. Soc., 1917, 707.)—W. G.

Electromotive activity of carbon monoxide. Auerbach. See XI.

Dakin's solution. Cullen and Hubbard. See XIX.

Densities of mixed acids. Pascal and Garnier. See XXII.

Phosphoric acid. Winkler. See XXIII.

Phosphoric acid. Karaoglanow. See XXIII.

PATENTS.

Nitric acid and ammonium sulphate; Manufacture of —. A. T. Cocking, and Kynoch, Ltd., Birmingham. Eng. Pat. 125,444, 1.8.16. (Appl. 10,852/16.)

POWER for the operation of an electric arc furnace for the production of nitric acid from the

atmosphere is obtained by burning solid fuel in a gas producer. The ammonia recovered from the gas is combined with the nitric acid produced to obtain ammonium nitrate. The nitric acid is subsequently regenerated for use in nitration processes by heating with excess of sulphuric acid (waste acid may be used), under reduced pressure in a continuously operated plant. The quantity of acid used for the decomposition is in greater or less excess according to whether it is desired to obtain an acid solution of ammonium sulphate for use in the manufacture of nitrophosphate fertiliser, or a slightly acid solution for the production of ammonium sulphate crystals.—S. S. A.

Sulphuric acid; Method and apparatus for concentrating — A. B. Newman, Langeloth, Pa. U.S. Pat. 1,294,525, 18.2.19. Appl., 28.10.16.

THE distillate obtained in concentrating sulphuric acid is recovered in the Glover tower or in the succeeding chambers, being maintained above its condensation temperature meanwhile by contact with the flue system between the roasting furnace and the Glover tower.—W. E. F. P.

Sulphuric acid; Apparatus for and method of concentrating — J. Patten, Baltimore, Assignor to S. M. Shoemaker, Eccleston, Md. U.S. Pat. 1,294,827, 18.2.19. Appl., 24.10.17.

IN an apparatus comprising a connected series of concentrators arranged at successively lower levels above a furnace, means are provided for introducing the acid at the upper end of the series and for applying the highest degree of heat at the same end.—W. E. F. P.

Sulphur dioxide in burner gases; Apparatus for the automatic determination and recording of — A. Abramski, Königstein. Ger. Pat. 309,981, 15.12.17.

THE apparatus contains three electric circuits, the first of which includes a selenium resistance, the second operates the valves through which the gas to be tested and a standard iodine solution are supplied to and discharged from the reaction vessel, and the third actuates the recording device. When the selenium cell is sufficiently illuminated, a galvanometer needle, provided at its point with a sliding contact, swings over to the stop and closes the second circuit. The selenium cell is illuminated by light which passes through the iodine solution, and hence receives more and more light as the iodine solution is decolorised by sulphurous acid.—T. St.

Electrolysing salt solution; Apparatus for — T. Matsushima, Kanagawaken, Japan. Eng. Pat. 114,623, 28.3.18. (Appl. 5479/18.)

THE apparatus comprises an outer tank containing the anodes and an inner tank with cathode. The inner tank is provided with a thin horizontal layer of mercury supported by a porous disc forming the base of the tank, so that the sodium is taken up by the lower surface of the mercury layer and recovered at the upper surface as caustic soda. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 17,169 of 1892 and 24,274 of 1893; this J., 1893, 277; 1894, 404.)—B. N.

Sulphuryl chloride; Manufacture of — A. Boake, Roberts and Co., Ltd., London, and T. H. Durrans, Oxford. Eng. Pat. 124,542, 26.1.18. (Appl. 1520/18.)

SULPHUR dioxide and chlorine are caused to react in the presence of one, or more, of the following substances: terpene hydrocarbons; esters which

are compounds of saturated alcohols or of monohydroxyphenols with monobasic aliphatic acids containing carbon, hydrogen, and oxygen only, and also triphenyl phosphate and tricresyl phosphate; ethers which are the mixed or simple saturated aliphatic ethers or the simple saturated aromatic ethers and also the terpene ether cineol (eucalyptol) and the saturated monohydroxyphenols which contain one benzene ring only, the ethers, phenols, and esters being limited to those which contain carbon, hydrogen, and oxygen only but no substituting group or groups other than radicles containing carbon and hydrogen only. Reaction occurs without the aid of light or pressure. The gases may be passed into the reaction vessel either together or alternately and either continuously or intermittently. The temperature should be sufficiently low to prevent the catalyst and the sulphuryl chloride formed from volatilising but sufficiently high to prevent the catalyst from solidifying. The following catalysts have been found to be particularly advantageous: pinene and limonene; methyl acetate, isomyl formate, ethyl butyrate, phenyl acetate, phenyl ethyl acetate, glycerol triacetate and oils which are esters of glycerol; ethyl ether, isobutyl ether, benzyl ether, cresyl ether; triphenyl phosphate, tricresyl phosphate.—H. W.

Sodammonium sulphate from nitre cake or other acid sodium sulphates; Production of — H. M. Dawson, Leeds. Eng. Pat. 125,311, 11.9.18. (Appl. 14,756/18.)

NITRE cake and sulphuric acid are dissolved in water or in the mother liquor obtained in a later stage of the process, and the acid is neutralised with ammonia. The proportion of nitre cake and acid is such that after neutralisation the solution contains ammonium sulphate in excess of sodium sulphate (e.g., in the molecular ratio of 2.5 to 1.5). The concentration of the hot solution is adjusted by the addition of water or by evaporation, to contain 100–140 molecules of salt per 1000 molecules of water. On cooling, sodammonium sulphate crystallises. Equivalent quantities of sodium sulphate and sulphuric acid in the form of nitre cake and acid are added to the mother liquor, the concentration of the hot solution obtained is adjusted, and a further quantity of sodammonium sulphate crystals produced by cooling. (See also this J., 1919, 98 t.)—S. S. A.

Alkaline nitrates; Process for the production of — by oxidation of ammonia. F. Bensa, Genoa, Italy. Eng. Pat. 125,453, 4.8.16. (Appl. 11,036/16.) Int. Conv., 4.8.15.

A MIXTURE of steam, ammoniacal gases, and a considerable quantity of air or oxygen is introduced into a retort maintained at 600°–800° C., in which the gases come in contact with, first a layer of platinised or palladiumised asbestos, and then separate layers of copper oxide, iron oxide, and oxides of rare earths. The gases issuing from the retort are led directly through a series of receptacles containing solid alkali carbonates heated to 300°–350° C. The alkali nitrate formed fuses and is drawn off.—L. A. C.

Sodium carbonate and ammonium sulphate from bisulphate of soda; Manufacture of — G. N. Vis, Paris. U.S. Pat. 1,294,523, 18.2.19. Appl., 21.9.17.

AN aqueous solution of sodium bisulphate is treated with ammonia and then saturated with carbon dioxide under slight pressure.

—W. E. F. P.

Ammonia; Process for the production and purification of — W. S. Landis, Assignor to American Cyanamid Co., New York. U.S. Pat. 1,296,820, 11.3.19. Appl., 5.11.18.

AN impure compound (e.g., a cyanamide or cyanide), is mixed to a thin paste with water, and after removing some of the impurities by blowing with an inert gas, it is heated under pressure.

—S. S. A.

Potash and the like; Method of extracting — A. B. Andrews, Assignor to H. F. Kelley, Auburn, Me. U.S. Pat. 1,296,035, 4.3.19. Appl., 6.3.18.

POTASH-BEARING silicate, e.g., feldspar, is treated with an alkaline-earth hydroxide (e.g. lime), in a series of fractional digestions in counter-current, each fresh charge of feldspar and lime being treated with the liquor separated from the sludge of the previous extraction.—S. S. A.

Potassium compounds; Process of obtaining — G. F. von Kolnitz, Stockertown, Pa. U.S. Pat. 1,296,141, 4.3.19. Appl., 1.7.18.

NATURAL potassium-bearing material is exposed at about 350° C. to the action of gaseous hydrogen chloride and the potassium chloride formed is recovered as such.—S. S. A.

Potassium salts; Process of extracting — from feldspar. Process of extracting potassium [salts] from minerals. Process of producing potassium salts. H. Blumenberg, jun., Assignor to Chemical Construction Co., Los Angeles, Cal. U.S. Pats. (A) 1,296,457, (B) 1,296,458, and (C) 1,296,459, 4.3.19. Appl., (A) 23.7.17, (B) (C) 4.12.17.

(A) FELDSPAR is mixed with an acid sludge and an alkaline-earth sulphate, heated in presence of air, and the soluble potassium salt thus formed is extracted. (B) A mineral containing potassium compounds is mixed with a nitrate, e.g., lead nitrate, which evolves nitric acid when heated, and the mixture heated until it fuses and all the nitrogen oxides are expelled. The residue is treated with an acid and the soluble potassium salt extracted. (C) A powdered mineral containing potassium compounds is fused with a reagent capable of rendering the potassium compounds soluble, e.g., sodium carbonate; the fused mass is extracted with water, treated with sulphur dioxide, dehydrated to render the silicates insoluble, and potassium sulphite extracted from the product.

—A. B. S.

Potassium nitrate [from gases from cement kilns]; Process of producing — H. Blumenberg, jun., Los Angeles, Cal. U.S. Pat. 1,296,460, 4.3.19. Appl., 2.1.18.

GASES containing potassium compounds and cement dust in suspension are passed through a solution of a metallic nitrate, e.g., sodium nitrate, the solution being afterwards evaporated to dryness to render the silicates insoluble; potassium nitrate is then extracted from the product with water.

—A. B. S.

Potassium chloride [from cement-kiln gases]; Process of making — H. Blumenberg, jun., Los Angeles, Cal. U.S. Pat. 1,296,461, 4.3.19. Appl., 28.1.18.

WASTE gases containing potassium compounds and cement dust are treated with an aqueous solution of sodium chloride, so as to form potassium chloride, which is afterwards separated from the solution.—A. B. S.

Potassium salts; Apparatus for recovering — from cement kilns. Process of recovering compounds from waste gases of cement kilns and the like. H. Blumenberg, jun., Oro Grande, Cal. U.S. Pats. (A) 1,290,462 and (B) 1,296,463, 4.3.19. Appl., 15.3.18.

(A) AN apparatus for recovering potassium compounds carried in suspension in hot gases, comprises two precipitating chambers, and means for bringing a precipitating liquid into contact with the gases in the chambers; a large portion of the potassium compounds and practically all the other solids are precipitated in the first chamber and the remainder of the potassium compounds in the second chamber. The solutions from the two chambers are collected independently. (B) Hot gases from cement kilns are passed successively through two precipitating chambers. In the second chamber the precipitating liquid is sulphuric acid, and a clear solution of potassium sulphate is formed.—A. B. S.

[Potassium compounds;] **Process of treating cement-kiln gases [to recover —]. Process for recovering potassium compounds from waste gases of cement kilns or the like.** H. Blumenberg, jun., Oro Grande, Assignor to Chemical Construction Co., Los Angeles, Cal. U.S. Pats. (A) 1,296,465 and (B) 1,296,466, 4.3.19. Appl., 24.4 and 20.5.18.

(A) Hot gases from cement kilns are cooled and freed from most of the suspended cement dust, then treated with a liquid to extract the remainder of the cement dust and a portion of the potassium compounds, and afterwards passed through an aqueous mixture containing a compound having an affinity for carbon dioxide, whereby the remaining potassium compounds are converted into bicarbonate. (B) Hot gases from cement kilns are cooled to 200° F. (93° C.) and saturated with aqueous vapour and then cooled to 40° F. (5° C.) by passing through a refrigerator whereby the vapour is condensed and collects the potassium compounds.—A. B. S.

Potassium sulphate; Process of producing — H. Blumenberg, jun., Los Angeles, Cal. U.S. Pat. 1,297,638, 18.3.19. Appl., 2.1.18.

POTASSIUM sulphate is prepared by passing waste gases containing potassium compounds in suspension and carbon dioxide through an aqueous mixture containing an alkaline-earth sulphate and then separating potassium sulphate from the solution.—A. B. S.

Potassium compounds from cement-kiln gases; Apparatus for recovering — H. Blumenberg, jun., Oro Grande, Cal. U.S. Pat. 1,297,639, 18.3.19. Appl., 15.3.18.

AN apparatus for separating potassium compounds from cement-kiln gases comprises a dust-precipitating chamber, a precipitating tower, means for circulating an aqueous mixture through the tower to precipitate the cement dust and potassium compounds, a condenser connected to the tower and provided with vertical tubes open at both ends, and means for collecting and concentrating the aqueous solution of the potassium compounds.

—A. B. S.

Potassium nitrate; Process for making — H. Blumenberg, jun., Assignor to Chemical Construction Co., Los Angeles, Cal. U.S. Pat. 1,297,640, 18.3.19. Appl., 8.7.18.

A MINERAL containing potassium in an insoluble form is heated with a nitrate until fusion occurs

but below the temperature at which nitric oxide is evolved, and the resulting potassium nitrate is recovered.—A. B. S.

Potassium compounds; Process of producing —. H. E. Brookhy, Evanston, Ill. U.S. Pat. 1,297,078, 18.3.19. Appl., 7.10.18.

A HYDROUS potassium-containing silicate is mixed with a non-volatile alkali and a metallic chloride, the mixture heated to a temperature sufficient to dehydrate the silicate but not sufficient to produce sintering, maintained at this temperature for 30 to 60 minutes, and the soluble potassium compounds formed are recovered by leaching.—A. B. S.

Zinc arsenite; Method of producing —. C. D. Freeland, Upper Montclair, N.J. U.S. Pat. 1,296,344, 4.3.19. Appl., 28.8.18.

ZINC ARSENITE is prepared from arsenious oxide and zinc oxide by heating one of the oxides and causing it to react with the other oxide in water.—S. S. A.

Lead arsenate; Process of making —. G. R. Riches and W. C. Piver, Hoboken, N.J. U.S. Pat. 1,296,557, 4.3.19. Appl., 3.2.17.

TO A SOLUTION of lead nitrate (900 gallons of sp. gr. 1.02), lead oxide (1000 lb.) is added, then sufficient arsenic acid to combine with the basic lead nitrate formed, the temperature throughout the process being maintained at 30°–35° C.—S. S. A.

Lead acetate; Preparation of —. B. Camus, R. Duchemin, and G. Criqueboeuf, Paris. U.S. Pat. 1,297,792, 18.3.19. Appl., 30.10.17.

LEAD OXIDE is mixed with ethyl acetate in the presence of water, and heat is applied to the mixture to start the reaction.—S. S. A.

Calcium or other metal nitro-carbide [cyanamide]; Process of making —. J. H. Reid, Newark, N.J., Assignor to International Nitrogen Co. U.S. Pat. 1,297,246, 11.3.19. Appl., 28.6.15.

A MOLTEN metallic carbide, e.g., calcium carbide, is introduced into an atmosphere of nitrogen under pressure, and kept in contact with the gas until combination is complete.—L. A. C.

Waste gases [containing fluorine compounds]; Recovery process for —. I. Hechenbleikner, Assignor to Chemical Construction Co., Charlotte, N.C. U.S. Pat. 1,297,464, 18.3.19. Appl., 26.10.18.

WASTE GASES containing fluorine compounds are passed through a solution containing a hydrosilicic acid.—L. A. C.

Silica gel and process of making same. W. A. Patrick, Baltimore, Md. U.S. Pat. 1,297,724, 18.3.19. Appl., 7.12.18.

SUFFICIENT hydrochloric acid is added to a well stirred solution of sodium silicate to liberate the whole of the silica. The gel thus formed is allowed to set, washed, dried in a current of air at 75°–120° C., and then subjected to a vacuum.—L. A. C.

Salt; Process of extracting — from natural brines. A. E. Schaefer, Saginaw, Mich. U.S. Pat. 1,297,737, 18.3.19. Appl., 3.3.16.

FINE-GRAIN salt is added to an unsaturated brine until the liquid is saturated; the solution is then slowly evaporated to produce a coarse-grain salt.

After separating the salt the liquor is rapidly evaporated until fine-grain salt is deposited.

—L. A. C.

Bleaching powder chamber; Mechanical —. J. L. C. Eckelt, Berlin. Ger. Pat. 310,271, 3.3.18.

A BLEACHING powder chamber, of the type in which the inside fittings can be renewed, has openings at the side provided with covers, and removable shelves to receive the lime, arranged in tiers, and over which move scrapers attached to rods extending through the chamber.—C. A. M.

Titanic acid; Preparation of practically iron-free — from titanium solutions containing iron. Titan Co. A.-S., Christiania. Ger. Pat. 310,304, 27.4.17. Int. Conv., 9.8.16.

By precipitating titanic acid by heating a solution of quadrivalent titanium containing also trivalent titanium, oxidation of ferrous salts is prevented, and products practically free from iron are obtained. Since only about 5% of the quadrivalent titanium is converted into the trivalent form, neutralisation of the strong mineral acid in the solution prior to the precipitation is unnecessary.—C. A. M.

Rare earth metals; Process of preparing insoluble or sparingly soluble compounds [fluorides] of —. Gebr. Siemens und Co., Berlin-Lichtenberg. Ger. Pat. 310,305, 17.5.14.

INSOLUBLE compounds of rare-earth metals are obtained by heating together the reacting salts containing water of crystallisation, or in solution, at temperatures above the b.pt. of the solvent, either at atmospheric pressure, or, if necessary, under pressure. For example, fluorides prepared in this way from chlorides at a red heat or lower temperature have a fairly high density, and are applicable, without further treatment, in the arc-light industry.—C. A. M.

Radio-active potassium chloride; Preparation of —. E. Penkala, Zagreb, Croatia. Ger. Pat. 310,481, 5.10.16. Int. Conv., 19.7.16.

POTASSIUM chloride, moistened with hydrochloric acid, is placed on the lower of two horizontal insulated metal plates arranged in an air-tight box. The two plates are connected to an electric circuit, the lower plate forming the cathode and the upper plate the anode. Attached to the side of the box is a retort containing a highly active radium preparation, the emanation from which passes through the neck of the retort on to the negatively charged potassium chloride. In order to drive off the emanation completely the retort is heated, but not above 200° C. By decomposition of the emanation, solid radio-active bodies are formed on the surface of the potassium chloride and are converted by the hydrochloric acid into the corresponding chlorides.—L. A. C.

Hydrogen; Manufacture of —. E. B. Maxted and G. R. Ridsdale, Walsall. Eng. Pat. 125,112, 22.5.16. (Appl. 7286/16.)

IRON oxide is reduced at a red heat by a gas of high reducing and calorific power, which has been modified either in the process of manufacture or by suitable additions, so as to contain less than 10% by volume of diluents such as nitrogen, and more than 10% of carbon dioxide, the remainder of the gas consisting substantially of hydrogen and carbon monoxide, and the volume of the carbon monoxide being not substantially less than that

of the dioxide. On reoxidising the iron by steaming in the usual way, hydrogen of improved quality, i.e., with less carbon monoxide, is obtained. The reducing gas should be free from steam and contain as small as possible a percentage of diluting gases.—S. S. A.

Hydrogen; Manufacture of — E. B. Maxted, Walsall. Eng. Pat. 125,410, 5.7.16. (Appl. 9481/16.)

In the manufacture of hydrogen by alternate reduction and oxidation of a reaction mass such as iron oxide, the speed of reduction is increased by incorporating with the reaction mass a small percentage of an alkali or an alkaline-earth either alone or in admixture with a small quantity of copper or a copper compound, the activating addition being fixed by heating the mass to a high temperature.—S. S. A.

Cooling apparatus. Eng. Pat. 125,101. See I.

Treating cement mixtures. U.S. Pat. 1,296,464. See IX.

Roasting zinc sulphide ores. Eng. Pat. 124,266. See X.

Manganese dioxide. U.S. Pat. 1,293,461. See XI.

Ammonia in gases etc. Ger Pat. 309,733. See XXIII.

VIII.—GLASS; CERAMICS.

Optical glass melting; Technique of — C. N. Fenner. J. Amer. Ceram. Soc., 1919, 2, 102–145.

In making optical glass, the purity of the materials is of paramount importance. Potassium sulphate and chloride are objectionable as sources of potash, and nitre should not be used in such a proportion that it can segregate and attack the pot unduly. The replacement of potash by an equal weight of soda has no serious effect on the refractive index of the glass, but may increase the colour. As a source of lead, either red lead or litharge may be used. All the materials, but especially the sand, should pass through a 35-mesh sieve. The cullet should be crushed and the iron removed by magnets. The batch is well mixed in a long open box by means of wooden paddles, the material being moved at least three times from one end of the box to the other, and the mixture is passed through a 4- or 6-mesh sieve. Meanwhile the pot is heated rapidly to 1400° C., and maintained at that temperature for one hour. The pot is then glazed by pouring cullet around the inside and allowing it to flow to the bottom so as to fill any pores, and is kept at 1400° C. for another hour, after which it is half filled with batch. When this has melted, the remainder of the batch is added in smaller quantities until the pot is filled to 1½ in. below the rim with molten glass. During the melting the furnace atmosphere must remain fully oxidising, the visible flames not extending much above the crown of the pot. The surface of the glass should be skimmed with an iron blade on a long handle, applied with smooth and regular strokes so as to avoid forcing the scum into the molten metal. As little material as possible should be removed during skimming. After resting for 1 hour the glass should be stirred thoroughly first by hand before the melting is complete, and later mechanically with a thick-walled clay tube, water-cooled internally, which is held vertically, and moved in a series of circles and simultaneously

up and down, the speed of the stirrer being varied as required from 4 to 28 revs. per min. When the mechanical stirrer is first introduced the radius of the stirring-circle should be very small; it is gradually increased later, a maximum radius of 7 in. in a 25 in. pot being satisfactory. When the melting is finished and the glass is cooling the radius of the stirring circles is again reduced. The stirring is continued until the pot is withdrawn from the furnace at 900°–1200° C. Considerable importance is attached to the details of the stirring and several charts are shown. A block of wood or a potato may be added when the glass has reached an "open boil" in order to free it from persistent bubbles. A small quantity of ammonium nitrate wrapped in paper, immersed and held near the bottom of the pot by an iron rod, is stated to be specially suitable for plain optical glasses. The filling and melting usually require 8–10 hours after which the glass remains quiescent for 2–3 hours to "fine." The melting and fining may usually be effected at 1400° C., but if sulphates or chlorides are present a temperature of 1420°–1430° C. should be employed. The temperature should not rise more than 20° C. above the one specified or excessive volatilisation of alkalis and corrosion of the pot will occur. Care must be taken that the pot does not leak and to avoid leakage of water from the water-cooled stirrer. After the stirring has stopped, the stirring rod should be drawn to the side of the pot and held there by means of an inverted U-bar. If the stirrer is lifted out of the glass its removal tends to produce striae. The pot should then be removed as rapidly as possible, less than five minutes being usually required. It should not be allowed to cool quickly or "vacuum bubbles" may occur. They may be eliminated by reheating the glass to the softening point.—A. B. S.

Optical glass manufacture; An improved method of — G. W. Morey. J. Amer. Ceram. Soc., 1919, 2, 140–150.

The time required to fill, melt and fine a charge of optical glass may be reduced to 24 hours, thus practically doubling the output of glass, by commencing the stirring by hand as soon as the pot is half full of molten glass, continuing until the pot is withdrawn from the furnace. This procedure avoids the separation of the fluxes, lessens their corrosive action, facilitates an early escape of bubbles, and avoids the necessity of a fining period.—A. B. S.

Porcelains; Possible cause of dielectric failure of — C. Treischel. J. Amer. Ceram. Soc., 1919, 2, 96–101.

PORCELAIN insulators which are free from mechanical defects may fail dielectrically by the current rupturing the crystals or glassy magma (the converse of Kelvin's piezo-electric effect; compare this J., 1919, 159 n) or leaking through the voids in the mass. In the case of failure due to the former cause, the dielectric strength might be increased by replacing the flint or quartz crystals in the porcelain by talc, pyrophyllite, sillimanite, or other material which is piezo-electrically inert and less brittle than feldspar.—A. B. S.

[Fireclay] stove-tiles; Resistance of — to sudden changes of temperature. G. Heinsteins. Keram. Rundsch., 1919, 27, 29.

TILES containing burned fireclay (grog) resist a sudden change in temperature (as when placed on a tripod and heated with a Bunsen burner, the top of the flame of which is in contact with the tile)

better than those in which a more silicious non-plastic material is used, though the difference is small in tiles which have been fired at a low temperature. The size of the particles of grog or quartz is not very important though a coarse-grained grog or quartz appears to be better than a fine-grained one. The larger the proportion of grog or quartz the better. Bodies with a very high silica-content tend to crack in the burning. Chalk greatly reduces the resistance of the body to changes in temperature and thus acts in an opposite manner to felspar.—A. B. S.

Refractories for the zinc industry. M. G. Babcock. J. Amer. Ceram. Soc., 1919, 2, 81—95.

RETORTS for the distillation of zinc should have a minimum porosity (5%) at 1300°—1400° C. The bonding clay should be low in metallic oxides (other than alumina) and devoid of free silica if the ore is basic, though a little free silica is an advantage when using silicious ore. The grog should preferably be made of calcined flint clay. Grog from old zinc retorts should not be used extensively as it contains a large proportion of zinc spinel, and retorts made from such grog are weak at high temperatures. The use of coke-dust (up to 10%) in the retort material produces smooth walls of great density and good working properties, and tends to reduce the absorption of zinc vapour and corrosion. When sand is used in the retort mixture, the cost of the retorts is reduced and they can be made thinner in the walls. The retorts are made of well-pugged and matured clay paste which is shaped in auger machines or by hydraulic presses working at 1800—2000 lb. per sq. in., dried in steam-heated chambers at 52°—54° C. for 50—120 days, and annealed at 750°—800° C. in kilns resembling glass-pot arches. To reduce absorption of zinc, retorts are sometimes glazed with a mixture of fluorspar and zinc sulphate or of soda, flint, and fluorspar. Condensers and receivers are moulded by hand from a material inferior to that used for the retorts, dried for 2—3 days, and burned at 900°—1000° C. —A. B. S.

PATENTS.

Ovens and kilns for pottery and the like; Fuel economiser or heat regulator for —. A. and T. Tilsone, Burslem. Eng. Pat. 125,486, 14.3.18. (Appl. 4493/18.)

A FUEL economiser or heat regulator for ovens and kilns consists of one or more fireclay grids placed on the outlet of the flues of the oven or kiln, each grid having slots or circular holes whereby the exit of the waste gases is throttled and the heat more efficiently utilised. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 4910 of 1891; this J., 1892, 434.)—A. B. S.

Clay working. J. J. F. Brand, Roseville, Ohio. U.S. Pat. 1,296,472, 4.3.19. Appl., 17.1.18.

CLAY or the like is pugged in *vacuo*.—A. B. S.

Refractory article. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,296,715, 11.3.19. Appl., 27.9.18.

A REFRACTORY article is composed of fireclay, grog, and crystalline carborundum, the major part of the carborundum being "coarser than No. 60" and constituting less than 60% of the mixture. —A. B. S.

Glass; Apparatus for delivering molten —. W. C. Blank, San Francisco, Cal., U.S.A. Eng. Pat. 125,560, 17.10.18. (Appl. 16,973/18.)

Separator for clay. Eng. Pat. 125,344. See I.

Tunnel-kiln. U.S. Pat. 1,295,955. See I.

Hollow objects of compressed powder. U.S. Pat. 1,286,089. See X.

IX.—BUILDING MATERIALS.

Portland cement; Effect of the addition of slag to —. P. C. H. West. Trans. Faraday Soc., 1919, 14, 44—45.

THE addition of slag in the manufacture of cement is stated to be of no advantage as a general rule, except in reducing the cost, though the cement containing slag may still be quite a good one, and in some cases the addition of slag may be of advantage in reducing the quick-setting character of the cement.—B. N.

Agglomeration of granular masses. Donnan. See I.

Lime burning. Mount. See VII.

PATENTS.

Waterproof compound [from tar] for roofing or other purposes. S. G. Kelsey, London. Eng. Pat. 125,492, 12.4.18. (Appl. 6248/18.)

A WATERPROOF preparation for roofing or other purposes consists of 2½ galls. of cold tar (or pitch and tar oil) mixed with 11 lb. of cotton or wool fibre or hair, or of 156 lb. of animal or vegetable fibre, 36 lb. of silica, 40 lb. of magnesium chloride, 40 galls. of gas tar or gas-tar pitch, and 10 galls. of gas-tar oil.—A. B. S.

Cement mixtures; Process of treating — for the recovery of potassium compounds. H. Blumenberg, jun., Oro Grande, Cal. U.S. Pat. 1,296,464, 4.3.19. Appl., 15.3.18.

A SMALL percentage of a nitrate, e.g., 1—2% of sodium nitrate, is added to cement mix so as to increase the volatility of the potassium compounds in the latter.—A. B. S.

Portland cement; Process of treating — and the resulting product. H. Blumenberg, jun., Oro Grande, Cal. U.S. Pat., 1,296,467, 4.3.19. Appl., 31.5.18.

HYDRAULIC cement is treated with an ammonium salt the acid radical of which is capable of forming insoluble compounds with the magnesium, aluminium, and iron bases present.

Toxic cement. H. Blumenberg, jun., Oro Grande, Cal. U.S. Pat. 1,296,468, 4.3.19. Appl., 31.5.18.

A MIXTURE of hydraulic cement and not more than ½% of copper sulphate.—A. B. S.

Concrete and similar cementitious materials; Method of and apparatus for mixing —. H. P. Brown, New York. U.S. Pats. (A) 1,297,080 and (B) 1,297,081, 11.3.19. Appl., 24.12.14.

(A) SUPERHEATED steam is supplied to the concrete ingredients during mixing, which is effected under

pressure. (b) The concrete is mixed under the pressure of superheated steam, then discharged from the mixer, granulated by means of a steam blast independent of the pressure applied during mixing, and the granules impelled away from the mass.—A. B. S.

Cement-making process [and production of magnesium and ferrosilicon]. W. McA. Johnson, Hartford, Conn. U.S. Pat. 1,297,297, 11.3.19. Appl., 12.2.15.

AN acid mineral and a basic mineral, e.g., lime and aluminium silicate (shale), are heated separately to incandescence, then brought together in an electric furnace, and heated further, whereby they form a fusible slag which is converted into "wool" by blowing and the "wool" ground to form a pulverulent cementitious material. If the minerals contain magnesium, the latter is volatilised and recovered as a by-product, whilst if iron and silicon are also present, fused ferrosilicon is also obtained.—A. B. S.

Cement-fibre board. J. E. Lappen, Winona, Minn. U.S. Pat. 1,297,480, 18.3.19. Appl., 5.8.16.

CEMENT-FIBRE board is made by disintegrating mineral fibrous material in water, collecting the fibres in the form of a wet film, sprinkling the surface of this film with cement, folding the film upon itself until sufficiently thick, and applying pressure.—A. B. S.

Water-resisting admixtures for hydraulic cement; Preparation of —. Reckord-Zement-Industrie G.m.b.H., Berlin. Ger. Pat. 308,874, 20.10.16.

BITUMINOUS earths such as aluminiferous ozokerite, asphalt, bituminous shale or brown coal are subjected to slow destructive distillation, the residue is strongly ignited, and the porous material thus obtained is impregnated with the oily or tarry distillate, whereby a dry, stable, and readily pulverisable product is formed which is ground up with the cement. Lime may be added to the material before or after distillation, and if desired ignition may follow distillation as a direct continuation of the process.—G. F. M.

Cement etc.; Emulsion for waterproofing —. Reckord-Zement-Industrie Ges., Berlin. Ger. Pat. 310,893, 20.10.15.

AN emulsion of lime and shale oil or a mixture of bituminous matter and cement clinker, ground cement, or lime is added to cement, cement-mortar, lime, or lime mortar as a waterproofing agent.—A. B. S.

Bituminous composition [cement]. R. Illemann, Glasgow. U.S. Pat. 1,296,083, 4.3.19. Appl., 10.10.17.

See Eng. Pat. 105,202 of 1916; this J., 1917, 552.

Wood; Process for treating —. W. Powell, London, Assignor to Powell Wood Process (North America), Inc., New York. U.S. Pat. 1,297,491, 18.3.19. Appl., 17.6.16.

See Eng. Pat. 9044 of 1915; this J., 1916, 842.

Potassium salts from cement-kiln gases. U.S. Pats. 1,296,460—3, 1,296,465—6, and 1,297,638—9. See VII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron-carbon diagram; The liquidus in the —. G. Cesaro. Iron and Steel Inst., May, 1919. [Advance copy.] 9 pages.

THE author has plotted the temperatures at which molten iron-carbon alloys commence to solidify, as determined by Carpenter and Keeling (this J., 1904, 608), against the number of carbon atoms contained in a unit of 100 atoms of the alloy, and also against the number of mols. of cementite per 100 mols. of alloy, assuming the molecule of iron to contain two atoms. Whether Raoult's law or a more general formula due to Le Chatelier and Schroeder be adopted, the intermediate temperatures calculated from Carpenter and Keeling's extreme determinations agree better with the measured temperatures on the assumption that molten iron-carbon alloys are composed of iron and cementite and not of iron and carbon. The best agreement is obtained by the assumption of a rectilinear variation, which is afforded by the $\text{Fe}_m\text{C} - \text{Fe}$ hypothesis. It is impossible to obtain a rectilinear variation for the system $\text{Fe}_m\text{C} - \text{Fe}_m$, if m has any other value than 2, and from the hypothesis that the alloys are composed of the system $\text{Fe}_m - \text{C}$, it is impossible to obtain rectilinear variation with any value of m .—T. H. Bu.

Iron-carbon alloys; Graphitisation in —. K. Tawara and G. Asahara. Iron and Steel Inst., May, 1919. [Advance copy.] 16 pages.

A SERIES of alloys was prepared from charcoal iron containing practically negligible amounts of impurities, the carbon content varying between 2.95 and 3.92%, and the experiments were so devised that only one factor differed in each case. As the material used contained practically nothing but iron and carbon, graphitisation was almost entirely due to the slow cooling of the metal at or near its solidification point. It was found that the amount of carbon when ranging from 2 to 4% is not a decisive factor in graphitisation. It causes no change in the species of microscopical constituents but influences the quantity of graphite produced in that, under favourable conditions, the excess of carbon above the limit of saturation of primary austenite (2%) separates as graphite. The maximum temperature reached has apparently no effect on graphitisation. Graphitisation took place when the temperature of the mould was 1000° C., but 1100° C. was found to be the most favourable temperature. It did not take place at 900° C., even when this was maintained for 7½ hours. When the mould was kept at 1125°—1128° C. for 1½ hours, the eutectic being unable to solidify could not deposit graphite, and the metal quenched in water contained no graphite. The time of annealing, or rate of cooling of the mass in the earlier stages, does not have any appreciable effect on graphitisation. It is concluded that graphitisation takes place at a certain early stage of cooling covering some length of time (at least 1½ hours); after this the different conditions corresponding to slow cooling and to water quenching cause simply a change in the method of decomposition of the primary austenite. Quenching after a shorter time results in partial graphitisation. The theory of graphitisation put forward by the authors is that in molten alloys the cementite is probably dissociated to a slight extent, with formation of atoms of free carbon. These may serve as nuclei for the crystallisation of graphite. The dissociated atoms of carbon being thus deposited from the molten alloy further dissociation of cementite occurs in order to re-establish equilibrium and this process

is repeated as the graphite crystals are developed. The mechanism of the development of graphite flakes is also discussed in the paper.—T. H. Bu.

Iron; Carburisation of — at low temperatures.
A. McCance. Iron and Steel Inst., May, 1919.
[Advance copy.] 5 pages.

AN insight into the reactions taking place during the carburisation of iron at low temperatures can be obtained from consideration of the variation of the equilibrium conditions with temperature. Pure carbon monoxide in contact with iron is decomposed according to the equation, $2\text{CO} = \text{CO}_2 + \text{C}$. The composition of the gas at atmospheric pressure in equilibrium with carbon has been calculated and a curve drawn showing the percentage of carbon dioxide plotted against temperature. As the gas in contact with the iron undergoes slow enrichment with carbon dioxide other reactions are possible. The reactions are: $3\text{Fe} + 2\text{CO} = \text{Fe}_3\text{C} + \text{CO}_2$, $\text{Fe} + \text{CO}_2 = \text{FeO} + \text{CO}$, and $3\text{FeO} + 5\text{CO} = \text{Fe}_3\text{C} + 4\text{CO}_2$, and on the diagram the equilibrium percentages of carbon dioxide at different temperatures are plotted as before for each of these reactions. From the curves it is found that only in the early stages of the process can cementite be formed from iron direct through the action of pure carbon monoxide, and above 550°C . ferrous oxide is more easily converted than pure iron into carbide. In applying the calculations to blast-furnace gases allowance must be made for the presence of air which assures the presence of ferrous oxide, whilst the nitrogen lowers the partial pressure of the gaseous carbon oxides and thus the equilibrium value of the carbon dioxide is reduced.—T. H. Bu.

Steel metallurgy; Modern —. C. H. F. Bagley.
Iron and Steel Inst., May, 1919. [Advance copy.] 49 pages.

THE author describes a simple method for calculating the consumption of materials and the technical results in the manufacture of steel from any kind of pig iron and by any standard process. The character and the formation of slags are discussed and a table is given showing the percentage composition and the proportion of acid and basic constituents of normal steelworks tapping slags for what is considered good practice. Starting from typical pig irons of given analysis, the method consists in first calculating an oxidation table for the impurities in the raw pig iron. The products of oxidation pass into the slag and from the total weight of acidic oxides present the average production of slag can be determined by reference to a schedule of tapping slags. The burnt lime required is also found from the average production of slag. Having calculated the total production of slag its composition is stated in percentages of constituent oxides and its value as a fertiliser otherwise determined. An approximate balance sheet may then be drawn up, though some of the losses have to be assumed from known results in actual practice; a table of mechanical losses in the various processes is given. The processes are divided into "hot metal," "scrap and cold pig," and "duplex," and a detailed calculation is made for each process, using an appropriate iron, and the results, together with those for other possible irons, are tabulated for comparison. A final table showing a general summary of results is added. The effect of slag production on the output of open-hearth furnaces is discussed. If the normal slag production be reduced by 1% the steel production will be increased about 2½%; excessive slag production is therefore a serious hindrance to output and economy. In basic open-hearth furnaces, the production of slag per ton of steel is large

and the slag should be removed as early as possible. The existing processes are inefficient or expensive in this respect and the author has patented an improved process for removing slag from fixed furnaces by blowing it off (Eng. Pat. 116,663; this J., 1918, 472 A). In routine work the calculations can be translated into operating orders, and are useful for working the furnace or converter. Another use of the method is in its application to the problems of phosphate slag production. The conditions for higher grade slags and maximum output of steel are shown not to be opposed to each other, if the silicon of the iron and also extraneous silica are kept low and the content of total acidic oxides not below the normal 28% standard. The paper concludes with a consideration of the general quality of steel, the author holding that with proper working conditions as good a yield of sound steel from the ingot can be realised by one process as another.—T. H. Bu.

[Steel furnace;] The acid hearth — and slag.
J. H. Whiteley and A. F. Hallimond. Iron and Steel Inst., May, 1919. [Advance copy.] 44 pages.

THE acid open-hearth slags described consist principally of FeO , MnO , and SiO_2 , with relatively small quantities of other oxides. When the slag is slowly cooled, tridymite, cristobalite, fayalite, and rhodonite are present. The silica minerals solidify first, and are followed by fayalite or rhodonite as determined by the ratio of iron oxide to manganese oxide. Acid slags contain free tridymite after being heated at 1300°C . for 18 hours, and resemble the furnace hearth in structure. Large quantities of slag were found in the hearth, the silica content having been reduced from 96% originally to 67%. The upper portion consists chiefly of interlacing plates of tridymite with interstitial slag and the stability of the hearth depends on the rigidity of the tridymite network and the viscosity of the enclosed fluid slag. Oxidation of the impurities in the molten metal is effected partly by the addition of ore, and partly by the oxygen content of the gases in the furnace. This occurs to some extent by direct oxidation of the surface of globules of metal continually thrown up into the slag during the "boil," and also by the catalytic action of ferric oxide in the slag. Throughout the "boiling" period the content of ferric oxide remains very low (0.3%), but increases up to 3% with the diminution of the reducing action of the metal in the finishing period. It is estimated that one half of the carbon is removed by the ore addition, one quarter by gas oxidation through the slag, and one quarter by direct contact between metal and gas. The bases present are regulated by the viscosity of the slag. The effect of lime additions is to lower the ferric oxide content, and this action is probably of great value during "dead melting" in that the metal is protected from oxidation by the inhibition of the catalytic oxidation due to ferric oxide.—C. A. K.

Wrought iron and mild steel; The refining process in the manufacture of —. B. Osann. Chem.-Zeit., 1919, 43, 105.

IN the refining of wrought iron ferrous oxide present in the slag is not reduced, but reduction occurs at the higher temperature attained in the refining of mild steel by the Bessemer or open-hearth process. Hence, if iron ore or hammer scale be added to the charge of a puddling furnace it passes into the slag, but the slag becomes inactive so soon as the iron oxide is reduced to the ferrous state. If the charge be then transferred to an open-hearth furnace the slag again acts as an oxidising agent, and at the highest temperature attained nearly all the ferrous oxide is reduced to metallic iron. In

all refining processes, even in the Bessemer converter, oxidation of the impurities is effected by means of iron-oxygen compounds and never by gaseous oxygen. In mild steel production ferrous oxide is dissolved by the molten iron and oxidises the impurities, and at the end of the process greater or smaller quantities of oxide are always present in the iron, so that the addition of deoxidising agents is necessary. In the case of wrought iron, on the other hand, oxidation of the impurities is effected entirely by the slag, and iron crystals separate successively from the crude iron bath (mother liquor), till the latter has entirely disappeared. Wrought iron consequently never contains oxide apart from that due to slag inclusions.

Electric steel refining furnaces. J. Bibby. Trans. Faraday Soc., 1919, 15, 79—89.

THE general metallurgical requirements in designing electric furnaces for refining steel are stated to be: (1) The shape of the hearth must be hemispherical or elliptical; (2) the openings through the roof and sides must be as few as possible, whilst sufficient for repairs, fettling, and survey of the hearth; (3) the roofs and walls must be protected against high temperature rays, and the heat must be directly absorbed by the metal; (4) a mechanical circulation of the metal in the vertical plane is necessary for maintaining a uniform temperature, facilitating the chemical reactions, and aiding the absorption of added alloys; (5) the furnace must be capable of raising the bath to any desired temperature and maintaining it; (6) it should be possible to have an oxidising, neutral, or reducing atmosphere at will; (7) the amount of refractories should be regulated to that necessary for retaining the heat. For steel making, the arc resistance furnace is stated to be better than the induction type. The various types of arc furnace are described, e.g., the Héroult, Girod, and Electro-Metals furnaces, and preference is given to the last-named form, as it more completely satisfies the conditions in (4) above. The ideal furnace is stated to be a two-phase one, with one phase connected to each upper electrode, and the third lower electrode forming a common return. A three-phase current may be transformed to a balanced two-phase system by using a Scott transformer. A description is given of a 20-ton two-phase Electro-Metals furnace and the mode of operating it in producing steel. For steel making it is probable that larger furnaces with four upper electrodes will be used, and the four-phase system developed for the large Electro-Metals furnaces meets the electrical and metallurgical conditions.—B. N.

Steel; "Flakes" in —. H. Styri. Chem. and Met. Eng., 1919, 20, 342—351.

ORDINARY chemical analysis of the metal does not indicate whether flakes will occur or not. The presence of "flakiness" in nickel-steels which had been subjected to different heat-treatments shows that different kinds of micro-structure (and therefore of heat-treatment) have no influence on the actual occurrence of "flakes." The non-occurrence of nickel silicate inclusions is confirmed, and the examination of a number of nickel-steels showed a general connection between the number of slag inclusions and the elongation and contraction, though the elastic limit and tensile strength were not affected. In all the good test-bars examined, either no slag particles, or only very small rounded particles were found. Some of the worst fractures can hardly be explained by the small number of slag inclusions and the cracking, or incipient cracking of the steel, due to unequal contraction during cooling or to expansion during re-heating, is appar-

ently the cause. A similar conclusion is arrived at in the case of carbon steels in which "flakiness" is less pronounced. (See also this J., 1919, 289 A.) —C. A. K.

[Steel;] Macro-etching and macro-printing [of —]. J. C. W. Humphrey. Iron and Steel Inst., May, 1919. [Advance copy.] 14 pages.

A KNOWLEDGE of the macro-structure of steel affords information of changes occurring in the ingot mould and during forging operations. In a cast metal the macro-structure is essentially due to segregation during solidification. The macro-structure of a metal may be observed by either sulphur printing or etching. Dilute nitric acid is particularly useful in revealing fine flaws or cracks, and carbon segregates show more distinctly than those of phosphorus or sulphur. Heyn's reagent (12% aqueous solution of copper ammonium chloride) is not sufficiently delicate to reveal minor segregations of phosphorus. The author uses a solution prepared by the addition of hydrochloric acid to Heyn's reagent, the most satisfactory solution for general use containing 120 grms. of copper-ammonium chloride and 50 c.c. of concentrated hydrochloric acid per litre of water. The result of this etching is to produce a marked relief effect on the surface of the specimen, the portions which solidified first being attacked to a greater extent than the more impure metal. The deposit of copper is made non-adherent by starting the etching with the neutral reagent until a thin covering of flocculent deposit is formed, and the acidity of the attacking reagent is then gradually increased to the maximum. After the deposited copper is wiped away, and the surface lightly polished, the relief portions show in strong contrast. Macro-etchings produced in this way may be printed directly by applying a film of printers' ink to the surface and subjecting it to pressure on a smooth paper. Satisfactory prints of the longitudinal section of ingots have been obtained. Phosphorus is believed to be the principal impurity which determines the dendritic structure of steels and it is suggested that the portion of the etching in relief might be scraped away, the specimen re-etched and re-scraped, until sufficient material was obtained for analysis. One analysis by this method showed 0.046% P in the relief portion of the etching as compared with 0.040% P in the average drillings.—C. A. K.

High-speed steel; Manufacture and working of —. J. H. Andrew and G. W. Green. Iron and Steel Inst., May, 1919. [Advance copy.] 32 pages.

NORMAL forging operations to which high-speed steel is subjected were accompanied by an examination of the metal at the different stages, beginning with an ingot 6 in. square. Little difference in micro-structure is shown whether reduction is effected by hammering or rolling, but the extent of reduction effected between the cast state and the finished bar is important. A reduction below 88% of a 6 in. square ingot will leave distorted carbide laminations of "massive" form, which do not enter solution during prolonged soaking at a temperature between 1150° C. and 1200° C. The hardness (Brinell) of the metal increases progressively with the decrease in cross-section during cogging operations. Annealing is effected best by raising the steel to a temperature (900° C.) slightly above the critical point, and allowing it to cool slowly to 700° C. Rapid cooling may then be allowed. The temperature limits for efficient hardening are within 10° C., and the process should be carried out between 1310° C. and 1320° C., the minimum time consistent with adequate soaking being allowed.—C. A. K.

Ferro-alloys and alloy steels; Manufacture and uses of —. Advisory Council of Sci. and Ind., Australia. Bull. No. 9, 1918. 46 pages.

A COMPILATION of modern knowledge of ferro-alloys and their manufacture, together with an account of the occurrence of the ores concerned in Australia. The production of ferro-chromium and ferro-tungsten from native material, in an experimental furnace of the Héroult type is described in an appendix. During smelting of the former an excess of 25% of carbon over the theoretical was necessary to give effective reduction of the chromium and the smelted metal gave on analysis: 63.6% Cr, 26.4% Fe, and 10% C. The carbon content was reduced to 2.8% by a refining process. Reduction of tungsten ore, mixed with iron oxide and carbon, in an electric furnace having a bottom electrode proved the best method of obtaining crude ferro-tungsten, and the impure alloy was afterwards refined in a Héroult furnace with the addition of iron oxide, lime, and fluorspar.—C. A. K.

Oxygen in iron and steel; Critical study of the Ledebur method for determining —. J. R. Cain and E. Pettijohn. U.S. Bureau of Standards, Technol. Paper No. 118, 1919. 33 pages.

LEDEBUR's method of determining oxygen in iron and steel by heating in a current of hydrogen is subject to many errors, and the precautions required are so great that it cannot be regarded as of practical value. The principal sources of error are impurities in the hydrogen used; too low a temperature, though there is no advantage in working up to the limits of a porcelain tube; failure to remove completely air from the combustion tube; moisture condensed on the sample; and the rate of passage of the hydrogen. Unless the current of hydrogen is maintained at not less than 60 c.c. per min., part of the iron oxide is reduced by carbon in the metal with the formation of carbon monoxide and dioxide. The greatest possibility for error lies in the inclusion of localised oxide spots or slag lines in the sample. The maximum thickness of drillings is given as 0.15 mm., and they should be produced under a protective layer of oil or other suitable liquid in order to avoid surface oxidation during the cutting. The method determines all the oxygen present in steel as FeO, Ni₂O, and WO₃, or in the higher oxides of these metals, in oxides of manganese higher than MnO, and in oxides of titanium and vanadium higher than Ti₂O₃ and V₂O₅, but none of the oxygen present in SiO₂, Al₂O₃, or Cr₂O₃. The reduction of carbon monoxide and dioxide by hydrogen also occurs to a variable extent under the conditions of the determination. If the oxides mentioned occur in combination as silicates, as is most probable in steels, reduction by hydrogen does not take place. Oxygen determinations by this method show no distinguishing features for steels produced by different methods, or for steels which have been deoxidised with a variety of deoxidisers. (See also Pickard, this J., 1913, 659.)—C. A. K.

Gold; Volatilisation of —. T. K. Rose. Inst. Min. and Met., Mar. 20, 1919. [Advance copy.]

TRUE volatilisation of gold is negligible at the temperatures of industrial furnaces (1000°–1300° C.) and cannot be measured with accuracy. The nature of the atmosphere in the furnace, if it remains unchanged, has no effect on volatilisation. Gold, particularly when alloyed with copper or silver, absorbs considerable quantities of gases when molten, and if the furnace atmosphere changes to oxidising conditions when the molten alloy contains a reducing gas, combination between the gases results, and showers of metallic globules are thrown up, and carried away in the gaseous current.

The action ceases as soon as the metal becomes saturated with oxygen, but is set up again if reducing conditions then arise in the furnace atmosphere. The loss by spiriting of globules is reduced if the metal is covered with a layer of slag.

—C. A. K.

Copper ores; Ammonia leaching of —. L. Eddy. Chem. and Met. Eng., 1919, 20, 323–334.

A DESCRIPTION of the process as carried out at Kennecott, Alaska, on an ore containing copper mostly as chalcocite and covellite and also oxidised copper as malachite, together with a limestone gangue. No native metal is present. Treatment of the ore on concentrating tables gives a good recovery of the heavy sulphides, but 40% of the malachite passes into the tailings. Before leaching with ammonia, the mill tailings are de-slimed, as material which will pass a sieve with 200 meshes per linear inch causes the ore to set in the tanks. The ore is allowed to drain thoroughly before lixiviation in order to avoid dilution and subsequent evaporation. Ammonia solution is then admitted through the bottom of the tank and is allowed to remain in contact with the ore for 12 hours without agitation. Further extraction of the ore by a circulating stream of weak copper-ammonia solution follows, and the ore is finally washed, and heated by means of a steam jet, ammonia being recovered from the vapours. The leaching tanks consist of cylindrical riveted steel chambers with domed tops. Leakage at the seams gives considerable trouble and electrically welded tanks are suggested to overcome the difficulty. All fittings are of iron and under certain conditions, occurring chiefly in the pipe lines, the ammonia solution has a deleterious effect on this metal, and copper is deposited. The hard copper oxide scale which tends to form on the interior surfaces of the evaporator has been a difficulty in evaporator construction and operation, and the design at present in use is an upright cylindrical chamber with a steeply inclined conical lower portion. Horizontal and slightly inclined surfaces are thereby avoided. Two of these evaporating vessels are used in series. Both are half-filled with strong ammonia-copper solution and steam is admitted into one by means of a pipe extending to the bottom of the cone. Vapours from the first evaporator are passed into the second and forward through a condensing system and an ammonia absorber. Carbon dioxide is evolved below the boiling point, and later ammonia is expelled, during which period the liquor shows a strong tendency to foam. Green copper carbonate deposits after 5 to 6 hours' boiling and is converted into the black oxide by raising the pressure in the chamber to 10 lb. or over. When precipitation is completed the contents of the first evaporator are filtered, and steam is admitted directly to the second, the vapours being passed to the first chamber, which has been charged with a fresh quantity of liquor. The filtrate from the evaporators contains sufficient dissolved copper quickly to destroy iron valves and piping, and the most satisfactory method of treatment is to apply steam pressure to the filter tanks so as to force the liquor through the filter cloths and away to the settling tanks, in which it may be treated with scrap iron.—C. A. K.

Copper leaching. P. R. Middleton. Chem. Eng. and Min. Rev., Australia, 1919, 11, 133.

THE difficulty experienced in smelting flotation concentrates has caused a reaction in favour of hydrometallurgical treatment of ores. Crushing and grinding should be sufficiently fine to separate the mineral particles from gangue, and it is rarely necessary to grind Australian ores finer than to pass a 40-mesh sieve. Chalcopyrite is converted to

cuprous sulphide, ferrous and copper sulphates, and sulphur dioxide at temperatures below 590°C ., and below 650°C ., cuprous sulphide and ferrous sulphate interact with the formation of copper sulphate and ferric oxide. At temperatures above 650°C ., cuprous sulphide is converted into copper oxide. The calcined ore is leached with an acid solution in a series of tanks provided with filter bottoms, or in Dorr agitators and thickeners arranged on the counter-current decantation system. The copper-bearing solution produced may be treated either with scrap iron or by electrolysis. In the latter process, insoluble anodes of lead, graphitised carbon, or manganite are employed, and the acid solution produced may be utilised for the extraction of a fresh quantity of calcined ore. A current density of 8–10 amps. per sq. ft. is generally applied, and for satisfactory working the electrolyte must contain above 1.5% of copper. The presence of arsenic in the electrolyte reduces the purity of the deposited copper.—C. A. K.

Aluminium alloys for aeroplane engines. F. C. Lea. Royal Aeronautical Soc., Apr., 1919. [Advance proof.] 15 pages.

ALUMINIUM alloys are used for aeroplane cylinders and pistons in order to reduce the weight and at the same time retain the rigidity of a thick casting. The cooling effect may be increased, as aluminium has a conductivity coefficient more than three times that of cast iron. An alloy, known as L5, containing 2½–3% Cu and 12–14% Zn can be cast reasonably well, though cracking during machining is a source of trouble. Steel liners are usually employed as aluminium alloys have apparently a high coefficient of friction, and sufficient negative clearance should be allowed to prevent the heating of the alloy above 300°C ., and to avoid cracking by expansion of the liner. A number of types of aluminium pistons showed a small growth due to heating and in certain cases "burning" of the piston crown occurred; possibly the softened eutectic was exuded from between the purer crystals. The hardness (Brinell) of the alloys (at 15°C .) becomes greater as the copper content increases, irrespective of other metals present, and the difference in hardness diminishes with increasing temperature until at 400°C ., the Brinell hardness number is practically independent of the copper content. No definite connection was found between the results obtained by the Wohler repetition test and the elastic properties of the alloys. Aluminium castings are porous to fluids and are treated with a hot alkaline solution of sodium silicate (water-glass) under pressure to seal the pores. The tensile strength at ordinary temperatures is not the chief physical property required in an alloy and more work is needed to determine the best resisting alloy at the higher temperatures to which it is subjected in use.—C. A. K.

Lead sulphide and the products of the roasting process; Chemical equilibrium between —. R. Schenck and A. Albers. Z. anorg. Chem., 1919, 105, 145–166.

THE reaction between lead sulphide and lead sulphate occurring in the roasting process is generally represented by the equations: (1) $\text{PbSO}_4 + \text{PbS} = 2\text{Pb} + 2\text{SO}_2$; (2) $2\text{PbO} + \text{PbS} = 3\text{Pb} + \text{SO}_2$. In reality, however, the reactions are much more complicated, as the existence of three basic lead sulphates must be recognised: PbSO_4 , PbO ; $\text{PbSO}_4 \cdot 2\text{PbO}$; and $\text{PbSO}_4 \cdot 3\text{PbO}$. Thus, according to the phase rule, seven solid phases are possible and there are thirteen possible monovariant systems, each containing three solid phases in equilibrium with the vapour phase, SO_2 . The authors have investigated the conditions of existence of nine of these systems between 500° and 820°C ., and have plotted the

temperature-pressure curves on an equilibrium diagram. Only those systems in which lead sulphide is present as a solid phase could be realised experimentally; other systems are apparently very unstable. Owing to the volatility of lead sulphide, the vapour phase was always saturated with PbS , which was often deposited in the apparatus in well-formed crystals. The vapour pressure of lead sulphide was found to increase from 2 to 17 mm. between 850° and 1000°C . Lead sulphide distils readily in a vacuum at 900°C . Since all silicate-containing materials are attacked by lead compounds, the experiments were carried out in containers of calcium phosphate made by calcining bones cut to the desired shape.—E. H. R.

Lead; Separation of — in the analysis of metallic calcium and "lurgie" metal. J. König. Chem.-Zeit., 1919, 43, 135.

TWO grms. of the metal is dissolved in nitric acid (sp. gr. 1.2), the solution boiled to expel some of the acid, then diluted with 100 c.c. of warm water, neutralised with ammonia, and treated with 300 c.c. of bromine-water; the precipitated lead hydroxide dissolves. The solution is then rendered ammoniacal, cooled, diluted to 500 c.c., and filtered, the first portion of the filtrate being rejected; 250 c.c. of the clear filtrate is boiled and the calcium precipitated as oxalate. In the case of "lurgie" metal, the filtrate must be treated with 20 c.c. of sulphuric acid (sp. gr. 1.5), boiled for 15 mins., the barium sulphate collected on a filter, and the calcium then determined in the filtrate.—W. F. S.

Cinnabar ores; Working of — at Monte Amiata. K. Oschatz, Glückauf, 1918, 54, 513–519, 533–539, 545–553, 556–570, 580–584, 595–598, 604–611, 617–625, 633–639. Chem. Zentr., 1919, 20, II., 252.

THE high percentage of moisture, averaging 15%, in the clayey portions of Monte Amiata cinnabar ores necessitates a preliminary drying, for which purpose drying machines of the drum type are more suitable than the older shaft or tunnel dryers. The danger of poisoning owing to escaping mercury vapour during the roasting of the ores is minimised as far as possible by central ventilation and also by regular medical supervision of the workers, by vapour baths etc. In the case of fine ores roasting in rotary tube furnaces has proved perfectly satisfactory both from the point of view of health and economic working.—G. F. M.

Magnesium; Reaction between sodium chloride solution and metallic —. W. Hughes. Chem. Soc. Trans., 1919, 115, 272–277.

THE reaction between magnesium and water is very slow at the ordinary temperature but is greatly accelerated in presence of neutral and alkaline salts, such as sodium chloride, sodium bicarbonate, sodium carbonate, and magnesium sulphate. Experiments with sodium chloride solutions at 25°C . have shown that the initial rate at which hydrogen is evolved depends on the concentration of the dissolved salt. The reaction velocity has a maximum value for a solution containing 32 mols. H_2O per mol. NaCl . This maximum cannot be satisfactorily interpreted in terms of the physical properties of sodium chloride solutions, and is regarded as evidence in favour of the specific nature of the catalytic action of the electrolyte present.—H. M. D.

Pulverised coal. Harvey. See II A.

Refractories for zinc industry. Babcock. See VIII.

Electric furnace methods. Bitchells. See XI.

PATENTS.

Steel; Manufacture of —. C. Dear, and The Miris Steel Co., Ltd., Sheffield. Eng. Pats. (A) 124,463 and (B) 124,465, 12.1.16. (Appls. 531 and 533/16.)

(A) STEEL is immersed hot in a solution containing nitric acid, sulphuric or sulphurous acid, and an ammonium compound, e.g., ammonium chloride, preferably with the addition of ammonia. The proportions of the materials are: 3 cwt. of nitric acid, 2 cwt. of sulphuric or sulphurous acid, 2½ cwt. of ammonium chloride, and 2½ cwt. of strongest liquid ammonia per 1000 gallons of water. (B) Freshly cast ingots, as soon as they can be stripped from the mould and while the interior of the ingot is still in a molten condition, are immersed in water or in a solution which will generate hydrogen on the surface of the ingot. The ingot remains submerged sufficiently long to prevent recalcinescence of the steel when withdrawn.—C. A. K.

Steel; Manufacture of —. C. Dear, and The Miris Steel Co., Ltd., Sheffield. Eng. Pat. 124,464. (Appls. 532, 12.1.16 and 11,426, 12.8.16.)

AN appliance for the convenient carrying out of the process described in Eng. Pat. 124,465 (see preceding abstract) consists of a tank provided with a grating on which an ingot may rest. Two reservoirs, at such a height that liquids can gravitate from the first to the second and then to the tank, contain the required solution, which can be pumped from the tank back to the reservoirs for further use.—C. A. K.

Iron and steel; Manufacture of —. S. Whyte, Redhill. Eng. Pat. 124,816, 19.4.16. (Appl. 575/16.)

SILICON is partially or completely eliminated from high-silicon cast iron by melting the metal under a layer of borax and adding carbon, preferably as graphite, to the molten iron. A current of air may be forced through the bath in order to aid the process.—C. A. K.

Manganese steel; Manufacture of —. R. A. Hadfield, Westminster. Eng. Pat. 124,817. (Appls. 576, 19.4.16 and 8803, 22.6.16.)

A TOUGHER steel is produced by increasing the silicon content of manganese steel to from 0.6% to 2.5%; other constituents are 10 to 17% Mn, and up to 2% C. Silicon may be partly or completely replaced by aluminium, and additions of chromium, nickel, cobalt, vanadium, tungsten, and titanium may also be made in order to vary the properties of the metal.—C. A. K.

Manganese steel; Manufacture of —. R. A. Hadfield, Westminster. Eng. Pat. 125,157, 19.6.16. (Appl. 8655/16.)

A MANGANESE steel or iron alloy of resistant quality contains 10–17% Mn, 1–4% Cu, up to 2% C, and up to 2% Si. The alloy may be toughened by heating it to 1050° C. or above, and quenching in water.—C. A. K.

Steel or other metal wire; Method of hardening and tempering —. H. Alexander and W. T. Vint, Leeds, and A. Imbery, Halifax. Eng. Pat. 125,180, 5.3.18. (Appl. 3825/18.)

WIRE is caused to travel, under oil, between two pairs of rollers, the distance between the first and

second pair being adjustable. Electrical conductors are attached to the rolls, and the circuit is completed by the portion of the travelling wire between the two pairs of rollers. Heating of the wire is accomplished by this means out of contact with air, and the length of the oil bath is such as to allow cooling to take place without oxidation of the surface of the wire. The temperature of the bath may be kept within required limits by circulation of the oil.—C. A. K.

Steel; Treating for aircraft —. D. J. Mooney, London. Eng. Pat. 125,544, 8.7.18. (Appl. 11,148/18.)

RIGIDITY is imparted to thin high-grade steel strip by passing the heated metal between revolving water-cooled dies or rollers. By this means the strip is suitably shaped, and at the same time is hardened to the necessary degree. Subsequent heat-treatment, which promotes distortion, is unnecessary.—C. A. K.

Steel-smelting furnace. W. G. Perkins, San Francisco, Cal., and W. H. Fitch, Pittsburgh, Pa. U.S. Pat. 1,295,586, 25.2.19. Appl., 22.12.17. Renewed 21.1.19.

Hot gases from a steel furnace pass through exit ports at the end of the furnace into a chamber in which expansion of the gases and precipitation of dust take place, and then through the regenerator to the chimney. Slag pockets are provided at each end of the furnace.—C. A. K.

Iron oxides; Method for reducing —. H. W. Lash, San Francisco, Cal. U.S. Pat. 1,296,973, 11.3.19. Appl., 4.9.17.

A MIXTURE of iron oxide and carbonaceous material in a finely divided condition is placed within a bundle of scrap ferrous material and the whole heated.—T. H. B.

Iron articles; Method of removing rust from —. Badische Anilin u. Soda Fabrik, Ludwigshafen. Ger. Pat. 310,261, 13.11.17.

RUSTY articles are treated with dilute acids (hydroferrocyanic and hydroferricyanic acids excepted) and simultaneously, or later, with an oil- or fat-emulsion. They are thus quickly freed from rust and left with a slight coating of oil which protects them against subsequent rusting.—T. St.

Iron; Manufacture of highly carburised spongy —. H. Poetter, Düsseldorf. Ger. Pat. 310,559, 12.3.16.

A MIXTURE of powdered coke and pyrolusite is formed into balls and roasted in a furnace, whereby the surfaces of the balls become mechanically strong and porous, and the interiors become spongy. Scrap steel is then fed into the furnace, and melting, runs down and is absorbed by the balls. The resulting highly carburised spongy iron may be used in place of pig iron in smelting processes.—T. St.

Ore; Machine for reducing [grinding] —. R. P. Park, South Melbourne, Australia. Eng. Pat. 124,946, 15.6.18. (Appl. 9882/18.)

A GRINDING pan consists of a revolving grinding ring which drives an inner floating ring supported on guide-rollers, and capable of independent vertical movement. The floating ring drives a series of inclined, tapering, crushing, and grinding rollers, arranged in stepped relation to the grinding ring. Pressure on the rollers may be varied by means of an adjustable spring which passes through a central ballast holder.—C. A. K.

Furnaces; Liquid sealed — [for heat-treatment of metals]. D. C. Bolton, Stoke-on-Trent. Eng. Pat. 125,015, 10.10.18. (Appl. 16,471/18.)

At the entry end of an inclined furnace chamber is a liquid-sealed charging chamber provided with a perforated platform which may be raised to the level of the furnace chamber. Articles to be treated are transferred from the platform to the furnace by means of a plunger, and an auxiliary inclined plunger may be employed to move the articles through the furnace. The exit end of the furnace is extended into a liquid seal.—C. A. K.

Blast furnaces. A. Frankignoul, The Hague, Holland. Eng. Pat. 125,194, 22.3.18. (Appl. 5117/18.)

IRON ore is reduced in a shaft furnace by means of gas generated in a separate gas-producer, and the spongy metal produced is further refined on the hearth by electrical resistance heating. Hot air (800° C.) from the recuperating stove is led to the tuyères of a gas-producer, and the producer gas is conveyed to the tuyères of the blast furnace at a temperature of 1500° C. The exit gases from the blast furnace are utilised in generating electrical power, which is used for the final melting of the metal on the hearth of the furnace.—C. A. K.

Furnaces [for heating bars, shells, etc.] A. Smallwood, London. Eng. Pat. 125,224, 12.4.18. (Appl. 6229/18.)

In a furnace adapted to heat the ends of articles which project into a heating chamber through holes in one wall of the chamber, a heat distribution chamber, a hot air flue, a waste gas flue, and (optionally) a regenerator used to transfer heat from the waste gases to the air are combined with the heating chamber in the same mass of brickwork. The heating chamber may be divided into a number of compartments each fed from the heat distribution chamber and hot air flue by ducts which can be individually controlled by dampers and exhausting into the waste gas flue. The heat distribution chamber may be fed from a combined or separate gas producer or fire-box.—B. M. V.

Rotary furnaces [for carburising and case-hardening]. W. O. Garbutt, and The British Carbonizing Co., Ltd., Gloucester. Eng. Pat. 125,484, 4.1.18. (Appl. 246/18.)

A SUBSTANTIALLY horizontal rotating chamber, surrounded by a fixed heating chamber, is permanently closed at the hotter end and is provided inside with helical ribs of comparatively small pitch and low depth. During the heating period the inner chamber is revolved slowly in such a direction that the articles to be treated are moved away from the cooler end of the furnace (which has a removable door) and continuously piled up against the hot closed end of the chamber. For discharging (which it is often desirable to do quickly) the cooler end is opened and the chamber revolved rapidly in the other direction. The furnace is specially suitable for carrying out the carburising and case-hardening process described in Eng. Pat. 114,446 (this J., 1918, 307 A).—B. M. V.

Roasting furnace or kiln; Muffled chamber suitable for use as a —. Roasting complex zinc sulphide ores or concentrates, particularly in conjunction with the manufacture of sulphuric acid. F. W. Harbord, London. Eng. Pats. (A) 124,265 and (B) 124,266, 19.3.19. (Appls. 4853 and 4854/18.)

(A) In a muffle furnace consisting of an inclined, rotary cylinder, within which a central chamber is heated by flues parallel to its length, the chamber

is practically triangular in cross-section, the angles being supported by the lining of the cylinder, and is constructed of bricks having a cross-section resembling the axial section of a truncated cone. (B) By means of a blast of air, regulated to oxidise the required proportion of sulphur, the finely divided ore is projected into the upper part of an externally heated, vertical or inclined, muffle chamber; so that the proportion of sulphur expelled in the upper and wider part of the chamber is sufficient to prevent caking of the charge in the lower part where the roasting is completed. Further quantities of air may be injected into the chamber at lower levels; and the ore may be re-treated in the same chamber. Alternatively, the latter may be employed in combination with the rotary muffle chamber described under (A).—W. E. F. P.

Roasting or drying ores; Apparatus for —. J. Molnar, Goose Bill, Mont. U.S. Pat. 1,296,834, 11.3.19. Appl., 8.10.18.

A ROASTER contains a number of superimposed platforms in which openings are provided for intercommunication between the sections. Rabble arms attached to a central rotary shaft agitate the material on each "shelf." By means of suitable gearing the rabble arms are caused to swing in a circle whilst rotating.—C. A. K.

Furnaces; Puddling, reheating, and similar metallurgical —. R. Cliff, Sheffield. Eng. Pat. 125,546, 15.7.18. (Appl. 11,553/18.)

In order to improve the harmful working conditions due to unusual atmospheric conditions, two adjoining sides of a furnace are provided with fire-grates. Flue gases are removed through open-topped vertical flues built against the opposite walls of the furnace and near the charging doors, the flues communicating with a common flue under the furnace. One fire-grate only is used, together with the corresponding flues on the opposite side of the furnace, and the choice of grate is dependent on the direction of the wind prevailing at the time. The other fire-grate and flues are shut off by means of a damper.—C. A. K.

Furnace; Electric metallurgical —. W. E. Moore, Pittsburgh, Pa. U.S. Pat. 1,293,164, 4.2.19. Appl. 30.7.17.

A CHAMBER or crucible adapted to contain metal, heated by an electric arc, is provided with an extension projecting downwards to form a loop, with a loop-channel therein, U-shaped in longitudinal section, communicating with the main chamber. The extension is in inductive relation to and looped around an electrical heating element, the U-shaped extension being elongated in transverse section, and expanding gradually in an upward direction from a point substantially midway of the heating element.—B. N.

Furnace; Electric — and method of melting metals and smelting ores. P. and I. B. Wright, Seattle, Wash. U.S. Pat. 1,296,896, 11.3.19. Appl., 21.11.17.

A RESISTOR is placed in the lower portion of the furnace chamber, and magnetic lines of force, extending longitudinally of the chamber, are produced by electro-magnetic means whereby the downward movement of a magnetisable body of metal and ores is retarded and the metal and ore are held suspended above and spaced from the resistor. Alternating currents are passed through the suspended material, from the secondary of a transformer, to produce an electric arc between the suspended material and the resistor and thus melt the metal.—B. N.

Open-hearth furnace. M. Hvid, Chicago, Ill. U.S. Pat. 1,296,189, 4.3.19. Appl., 21.10.18.

AN open-hearth furnace is provided with a slag-pocket below the hearth, and from the lower part of the slag-pocket, a flue, having a downward inclination, conveys the products of combustion into a shallow dust chamber situated under a checker-work regenerator chamber.—C. A. K.

Muffle for roasting zinc blende and other sulphurous ores. W. Hommel, Zürich. Ger. Pat. 309,654, 9.9.15.

THE ore in its passage through the muffle is heated by the hot gases from two furnaces arranged in juxtaposition. The gases from the principal furnace completely surround the ore-chamber, above and below, except for a portion situated about the middle of same. This portion is heated above by the gases from the principal furnace, and below by those from the subsidiary furnace alone. The principal furnace is kept in uniform operation, whereas the subsidiary one is well fired to begin with, the firing being subsequently decreased to suit the ore. The ore is fed at a uniform rate into the muffle, and the mechanical work necessary, as well as the time of roasting, are reduced to a minimum.—J. S. G. T.

Nickel; Extraction of — from silicate ores. H. W. C. Annable, Egham, and Nickel Concentration, Ltd., London. Eng. Pat. 125,119, 27.5.16. (Appl. 7562/16.)

SEE U.S. Pat. 1,289,072 of 1918; this J., 1919, 148 A. The ore may be heated with a sulphur-yielding material, such as pyrites, in presence of steam instead of with moist hydrogen sulphide, and a small quantity of sodium or potassium chloride or sea-water is preferably added to the charge. The nickel sulphide may be oxidised to sulphate, any basic nickel sulphate formed being dissolved by means of hydrochloric acid obtained from the furnace gases.

Electrical welding; Methods of and apparatus for —. T. E. Murray, Brooklyn, U.S.A. Eng. Pat. 120,906, 9.11.18. (Appl. 18,396/18.) Int. Conv., 9.11.17.

ONE of two bodies to be welded is heated electrically till it is plastic and is then brought in contact with the second body which is not heated. The two bodies are subjected to pressure in a transverse direction, to cause them to unite. An electrically operated device for supporting the bodies and for pressing them together is claimed.—L. L. L.

Metals of unequal fusibility; Process for welding two —. C. Kohler, Zürich, Switzerland. U.S. Pat. 1,296,815, 11.3.19. Appl., 28.12.17.

A LAYER of the more fusible metal is welded to the less fusible metal by a reducing flame, which heats the metals to the welding temperature and reduces any oxides, and a body of the more fusible metal is afterwards welded to the layer.—T. H. B.

Casting metals, and apparatus therefor. J. P. Auld and P. M. Tennick, Philadelphia, U.S.A. Eng. Pat. 124,232, 21.12.17. (Appl. 18,986/17.)

FLUID metal is caused to pass over a rotating surface before entering the mould, and is thereby cooled and its fluidity reduced to such a degree that it quickly solidifies in the mould and the effects produced by a slowly solidifying liquid core are avoided. The surface is preferably of funnel shape and may be cooled by air or by water. The cooled stream of metal is delivered from a nozzle, and the rotary motion of the appliance causes it to assume the form of a hollow cone as it enters the mould.—C. A. K.

Ores; Process of recovering values [graphite] from their —. W. O. Arzinger, Nashville, Tenn. U.S. Pat. 1,282,730, 29.10.18. Appl., 12.6.15.

FINELY-DIVIDED ore is introduced into a separating vessel through an opening in the dome-shaped cover and is forced downwards into a mixture of oil and water by jets of air under high pressure (over 2 lb., and up to 150–200 lb. per sq. in.). The values float up inside a perforated annular partition in the separating vessel, pass through the perforations, and overflow into an annular launder. Only a very small quantity of oil (1 drop to a gallon of water) is required, and 96% of the graphite present in crude graphite ore can be recovered in the form of a concentrate containing 80–88% of pure graphite.

Ore-separating process. A. J. Moxham, Wilmington, Del. U.S. Pat. 1,294,519, 18.2.19. Appl., 24.2.12.

SOLIDS such as ore particles having different specific gravities are separated by means of a dense liquid upon which a relatively light liquid is superposed, the particles of material being first coated with the latter and then caused to pass beneath the surfaces of the upper and lower layers in succession. The denser liquid has a sp. gr. between those of the solids to be separated, and the lighter liquid is such that the coating is retained by the particles when in the denser liquid. The separated solids are treated with solvents and centrifuged for the recovery of the denser and lighter liquids in succession.—W. E. F. P.

Ores and the like; Process and apparatus for the treatment of — [by flotation]. G. S. A. Appelqvist and E. O. E. Tydén, Stockholm. Ger. Pat. 309,088, 7.1.17. Addition to Ger. Pat. 277,847 (Eng. Pat. 402 of 1913; this J., 1913, 430).

THE ore, the oil or tar, and water are first mixed together and then delivered by a pump in the form of one or several jets against a fixed or movable wall, plate, dish, or the like, which is so situated over the vessel in which the separation is to be effected that the mixture falls into the vessel or can be conducted to it. The particles of oil or tar are thereby beaten up and finely divided in the mixture.—J. F. B.

Ores; Process of treating — by the flotation method. G. S. A. Appelqvist, Stockholm. Ger. Pat. 309,859, 2.12.16.

THE froth which separates in the treatment of ores by the flotation method is treated with an agent such as oil which breaks down the froth and liberates the entangled ore particles.—C. A. M.

Hollow objects of compressed metallic powder; Method of producing —. C. A. Pfanstiehl, Highland Park, Ill., Assignor to Pfanstiehl Co., Inc., Chicago, Ill. U.S. Pat. 1,286,089, 28.11.18. Appl., 4.11.16.

DISHES or the like for chemical operations prepared by compression of finely divided tungsten or tantalum or their oxides, magnesia, or thoria are non-uniform, and weak and porous at places, because these substances resist flow during compression. To overcome this difficulty a core of copper is embedded in the powder. At the pressures employed, viz., 130–160 tons per sq. in., copper flows sufficiently to equalise the compression pressure but not sufficiently to be forced into the pores of the compressed powder. The copper core can be removed from the finished article by means of nitric acid or the like.

Metals; Electrolytic refining of —. B. Bart, Newark, N.J. U.S. Pat. 1,295,100, 25.2.19. Appl., 12.12.17.

THE metal is deposited upon an anode core composed of solid portions and connecting necks, bordering on and alternating with open spaces not greatly smaller in area than the solid portions, until the open spaces are partly closed. The composite body, or grid, thus produced, is used as the anode in the final plating.—B. N.

Electric dissolution and precipitation of metals; Apparatus for the —. E. R. Holden, Los Angeles, Cal. U.S. Pat. 1,295,752, 25.2.19. Appl., 17.4.17.

AN apparatus for treating solutions containing metals comprises a cylindrical tank, in which rotates a vertical non-conducting shaft carrying a number of agitator arms arranged in sets one above the other. A cathode is arranged at the bottom of the tank, and a number of independent electric conductors convey current to the sets of agitator arms acting as the anodes, one conductor for each set, with means for independently controlling the E.M.F. of the current delivered to each set of anodes.—B. N.

Oxidation of rolled material [metal]; Method of and means for preventing —. B. P. Hazeltine, Wheeling, W. Va., Assignor to National Tube Co., Pittsburgh, Pa. U.S. Pat. 1,295,986, 4.3.19. Appl., 5.10.16.

METAL from the finishing rolls is allowed to cool in an atmosphere of steam to a temperature below that at which oxidation of the metal occurs.

—C. A. K.

Ores and metals; Process for treating — in reverberatory furnaces. G. C. Carson, San Francisco, Cal. U.S. Pat. 1,296,478, 4.3.19. Appl., 4.10.16.

THE material to be treated, e.g., copper ores or concentrates containing sulphur and iron, is charged so as to form a sloping embankment along the walls of a furnace, through which tuyères are fixed. The ore is smelted by utilising the heat of oxidation of the contained sulphur, and the liquid copper matte and slag run on to the bed of the furnace on which the matte is "bessemerised."

—C. A. K.

Ores; Treatment of [cupriferous] —. J. Irving, Bisbee, Ariz. U.S. Pat. 1,296,523, 4.3.19. Appl., 27.1.17.

CUPRIFEROUS ores, compounds, or products containing precious metals, are subjected to the action of an iron-containing electrolyte from the copper depositing tanks; after removal of the electrolyte, the ore is treated with a solution containing iron and chlorides which is afterwards passed over metallic iron, to reduce iron and precipitate copper and precious metals. The precipitate is removed and used to treat the electrolyte from the ore treatment in order to reduce the iron therein, copper being simultaneously dissolved. Precious metals are recovered from the residual sludge, and copper is deposited electrolytically from the solution.—T. H. B.

Copper from ores; Process of extracting —. N. Evans, Assignor to C. F. Schader and W. H. Heady, Los Angeles, Cal. U.S. Pat. 1,297,670, 18.3.19. Appl., 11.9.18.

ORE containing copper is treated with an aqueous solution of nitre-cake, the proportion of nitre-cake being 50% of the copper content of the ore. The metal is subsequently recovered from the copper sulphate solution.—C. A. K.

Sulphides; Process of desulphurising metal —. A. B. Foster, Washington, D.C., Assignor to Sulphur Syndicate, Ltd., London. U.S. Pat. 1,296,585, 4.3.19. Appl., 1.5.15.

METAL sulphides are roasted to produce gases containing sulphur dioxide, and the gases are made to react with a further quantity of metal sulphides heated to at least 700° C., until the major portion of the sulphur dioxide is reduced.

—T. H. B.

Platinum substitute; Composition of matter for —. F. A. Fahrenwald, Cleveland, Ohio, Assignor to The Rhotanium Co., Cleveland, Ohio. U.S. Pat. 1,296,988, 11.3.19. Appl., 13.7.16.

AN alloy for use as a platinum substitute contains palladium (10–40 atoms %) and silver (10–80 atoms %), together with one or more of the other metals of the gold series in the periodic table, having atomic weights between one hundred and two hundred times that of hydrogen.—T. H. B.

Zinc-lead alloy. H. Falkenberg, Weetzen. Ger. Pat. 309,955, 26.8.16. Addition to Ger. Pat. 300,111 (this J., 1919, 292 A).

CLAIM is made for a zinc-lead alloy as previously described characterised by an iron content of more than 1.6% and less than 3%. With gradually increasing melting temperature and iron content, the crushing strength increases.—T. St.

Aluminium; Method of casting — in iron or metal moulds. Metallindustrie Schiele u. Bruchsalser, Hornberg, Schwarzwaldbahn. Ger. Pat. 310,404, 19.2.18.

THE surfaces of the moulds and cores are coated with aluminium bronze varnish and the organic matter removed by slowly heating to about 400° C. The coating of aluminium bronze which is left permits of the moulds being heated to the melting point of aluminium before the metal is poured, and prevents the casting from sticking to the moulds.—T. St.

Bearing metals; Manufacture of white — containing silicon. C. Hassler, Aalen. Ger. Pat. 310,507, 20.7.17. Addition to Ger. Pat. 297,290 (this J., 1917, 889).

THE manufacture of white bearing metals as described in the original patent is simplified by the replacement of pure tin, lead, and antimony, by hard lead and tin containing lead. Preliminary alloys (A) or (B) are first prepared as follows:—(A) Hard lead (with 13–25% Sb) 56–76, tin (with 20–80% of Pb) 20–40, copper 1–4, and 30% silicon-copper 0.2–1.5 parts. (B) Hard lead 50–55, tin alloy (Sn 80–84, Sb 11–12, Cu 5–8 parts) 35–48, copper 1.5–8.5, and 30% silicon-copper 0.5–1.5 parts. The final alloy is composed of alloy (A) 60–95 and soft lead 5–40%, or alloy (B) 15–35% and the remainder either equal parts of hard and soft lead, or soft lead alone.—T. St.

Zinc; Electrolytic recovery of — [from solutions containing iron and manganese]. E. Langguth, Frankfurt. Ger. Pat. 310,846, 13.10.15.

FEROUS sulphate is oxidised to ferric sulphate in an anode compartment by the action of the manganese salts present in the solution. Determinations of iron and manganese must be made to ensure that sufficient manganese salts are present for the purpose, and the electrolysis should be conducted under conditions favourable to the formation of the more highly oxidised manganese

compounds, *e.g.*, high acid strength, zinc content maintained high in comparison with manganese content, presence of the sulphates of alkalis, ammonium, magnesium, or aluminium, and high anodic current density. The ferric sulphate is removed by zinc oxide in the usual way.—T. St.

Grey cast-iron; Manufacture of —. W. B. Hamilton, Sheffield. U.S. Pat. 1,296,384, 4.3.19. Appl., 20.12.17.

SEE Eng. Pat. 14,328 of 1917; this J., 1918, 271 A.

[*Tungsten; Treatment and circulation of hydrogen in connection with the reduction of tungsten trioxide [to —]*]. H. A. Gill, London. From Fansteel Products Co., North Chicago, Ill., U.S.A. Eng. Pat. 125,310, 9.9.18. (Appl. 14,614/18.)

SEE U.S. Pat. 1,286,088 of 1918; this J., 1919, 135 A.

Metals [aluminium]; Process of securing — from their compounds [aluminium chloride]. V. M. Weaver, Harrisburg, Pa., Assignor to Weaver Co. U.S. Pat. 1,297,946, 18.3.19. Appl., 11.1.15.

SEE Fr. Pat. 481,056 of 1916; this J., 1917, 144.

Separator for ores. Eng. Pat. 125,344. See I.

[*Magnesium and ferrosilicon*]. U.S. Pat. 1,297,297. See IX.

Metal paste or sludge. Eng. Pat. 124,006. See XI.

Electrodes for smelting. Eng. Pat. 124,116. See XI.

Arc-welding electrode. U.S. Pat. 1,294,250. See XI.

XI.—ELECTRO-CHEMISTRY.

Electric furnace methods; Application of — to industrial processes. H. Etchells. Trans. Faraday Soc., 1919, 14, 71–78.

A DESCRIPTION is given of the Greaves-Etchells furnace (Eng. Pat. 106,626; this J., 1917, 891), and the advantages accruing from it. Dealing with electric conditions it is stated that regulation, phase balance, and wave distortion have not received the attention which they deserve. Specimens of wave form obtained by means of the oscillograph in different types of furnaces are shown. In the case of the Electro-Metals furnace there is definite indication of a prolonged period of inertia while the current changes polarity, and this must be reflected to some extent in the primary system. The iron of the current transformer has the effect of softening the wave distortion. The Héroult method of transformer grouping is particularly susceptible to the setting up of circulating currents, which may account for the curious wave forms obtained with this furnace. Recent experiments have demonstrated that very appreciable losses may occur in transmitting power from the transformer to the furnace, not entirely through eddy-current losses set up in surrounding inductive circuits, but because of the skin resistance of the furnace leads. These losses may assume considerable proportions with large currents, and in large installations special precautions should be taken to minimise them. Possible sources of electrode losses should receive consideration. Carbon electrodes made from pitch-coke, anthracite, and petroleum-coke are most suit-

able for ore reduction, but for steel-making, graphite electrodes, which can be run at four times the current density, are preferable. Continuous-feeding electrodes provided with jointing nipples are common, but the only satisfactory method of jointing amorphous carbons is to use a graphite nipple.—B. N.

Electric furnaces; Control of —. F. E. Hill and A. P. M. Fleming. Trans. Faraday Soc., 1919, 15, 90–98.

THE two principal methods of furnace regulation are (1) variation of voltage; (2) variation of current. The methods of varying the voltage are dealt with in detail, *viz.*, alteration of the ratio of the main transformer by tappings or by an auxiliary winding, or the use of a primary or secondary booster transformer, or control of a motor generator; a comparison is made of these methods of control. The control by current regulation is accomplished by raising or lowering the electrodes, which may be effected by hand or by electrical or hydraulic power under manual control, or by an automatically controlled motor, and these methods of control are discussed.—B. N.

Carbon monoxide; Electromotive activity of —. F. Auerbach. Z. Elektrochem., 1919, 23, 82–84.

THE E.M.F. given by Hofmann (this J., 1918, 765 A) for the element O_2/CO cannot be directly compared with that calculated from the free energy of the reaction, $2CO + O_2 \rightleftharpoons 2CO_2$, because in alkaline electrolytes carbon monoxide is oxidised to carbonate and not to carbon dioxide.—J. F. S.

Dielectric failure of porcelain. Treischel. See VIII.

Dakin's solution. Cullen and Hubbard. See XIXB.

Electrical precipitator. Tolman and others. See XXIII.

PATENTS.

Electric heating by high frequency currents; Method of and apparatus for —. The Ajax Metal Co., Philadelphia, Assignees of E. F. Northrup, Princeton, N.J. Eng. Pat. 119,220, 19.3.18. (Appl. 4868/18.) Int. Conv., 19.9.17.

ELECTRIC furnaces of the induction type are operated by circulating about the resistor an oscillating current having its oscillations maintained in amplitude, as distinguished from the usual damped oscillations proceeding from an ordinary condenser when discharged through a gap. The oscillatory current discharge through the operating circuit is uninterrupted, and the operating circuit contains inductance and capacity proportioned so as to tune the circuit to approximately the frequency of the alternating current supplied to the circuit, the proportion between the inductance and capacity being adjustable to compensate for different operating conditions. The discharge is made through a metallic circuit containing the furnace coil for heating different resistors, thereby avoiding the necessity of a discharge gap, and the furnace coil circuit has a greater current than that of the supply circuit. (See Eng. Pat. 111,844; this J., 1919, 225 A; also this J., 1919, 202 A.)—B. N.

Electric furnace. F. von Schlegel, Evanston, Ill., and C. B. Fletcher, Indianapolis, Ind. U.S. Pat. 1,294,837, 18.2.19. Appl., 25.11.18.

In an electric furnace heated by a direct arc between the charge and an electrode above it, the melting chamber has a deep and relatively narrow,

inclined well, whereby excessive volatilisation of the molten charge is prevented, owing to the small area of the surface exposed. When melted, the charge is heated by an indirect arc, for which purpose a supplemental electrode is provided.

—W. E. F. P.

Furnace; Electric — and method of operating the same. J. R. Harbeck, New York, and E. G. Norton, Chicago, Ill. U.S. Pat. 1,295,309, 25.2.19. Appl., 24.4.17.

A HIGH pressure and high temperature electric furnace comprises a casing formed of concentric shells with hemispherical ends and means for closing the opposite ends, with electric heating means within the casing. The furnace temperature is equalised by convection of heat in a static body of liquid, and the temperature may be lowered by means of a flowing body of liquid. The pressure in the static body of liquid is balanced and equalised against the pressure of the gases in the furnace.

—B. N.

Induction furnace; Electric —. O. Brophy, Philadelphia, Pa. U.S. Pat. 1,296,752, 11.3.19. Appl., 12.6.18.

THE furnace comprises a substantially rectangular core, on the central portion of which is mounted a primary winding. The body of metal to be treated includes a main portion, a tubular portion, forming the secondary in an auxiliary cavity, partially surrounding and co-axial with the primary winding, together with oppositely-placed branches connecting the portions. The winding exerts a repulsive action on the metal in the auxiliary cavity and forces it into the main portion, magnetic lines of force cutting through the metal at definite points in the auxiliary cavity, thereby causing relatively intense circulation of the metal at these points.

—B. N.

Metals or alloys; Electrolytic preparation of — in the form of paste or sludge. B. Leech, Macclesfield, and H. and L. Slater, Ltd., Manchester. Eng. Pat. 124,006, 23.12.17. (Appl. 19,170/17.)

AN apparatus, for the electrolytic preparation of metals or alloys in the form of paste or sludge, is provided with anodes formed partly of the active metal and partly of a material, e.g., hard graphite, which resists or withstands the conditions of electrochemical action and does not disintegrate nor pass into solution. Means may be provided for varying or adjusting the ratio of the areas of the active and resistant portions of the anode immersed in the electrolyte. A group of vats may be used through which the same electrolyte is circulated, the vats being electrically connected in series or in parallel, or supplied with current independently. Anodes of active material may be used in some vats and anodes of resistant material in others. The flow of electrolyte may be controlled or regulated through any vat or group of vats, and the electrolyte may be circulated through a cooling or heating coil.

—B. N.

Electrodes, particularly for use in electric smelting and like purposes. S. C. Hazard, Jarrow, and H. S. Morris, Hebburn-on-Tyne. Eng. Pat. 124,116, 4.6.18. (Appl. 9226/18.)

DISTORTION of electrodes during the baking process is prevented by filling the socket, at the end serving as a base, with a plug of moulders' loam, clay, or other suitable material in a liquid or plastic condition.—B. N.

Electrode; Arc-welding —. C. V. Elliott, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,294,250, 11.2.19. Appl., 22.7.18.

THE electrode is composed of ferrous metal, with a coating of a calcium compound of inappreciable thickness having a high power of emitting electrons when heated.—B. N.

Electric dry cells; Resuscitating spent —. K. Hori, Hokkaido, Japan. Eng. Pat. 124,137, 12.7.18. (Appl. 11,464/18.)

SPENT dry cells are resuscitated by boring a hole in the cell from the top and filling it with a mixed solution of ammonium and sodium chlorides and oxalic acid. The cell is then heated and finally plunged into cold water.—B. N.

Accumulators; Electric —. W. G. Pearson, Woodford Green, and General Electric Co., Ltd., London. Eng. Pat. 124,378, 6.9.18. (Appl. 14,530/18.)

THE absorbent for the electrolyte is composed of a mixture of sawdust, fibrous asbestos, and celluloid chamferings or the like.—B. N.

Depolariser; Polymerised manganese dioxide —. A. A. Wells, Montclair, N.J., Assignor to National Carbon Co., Inc., Cleveland, Ohio. U.S. Pat. 1,293,272, 4.2.19. Appl., 25.10.15.

AN artificial active form of manganese dioxide is prepared by converting the natural dioxide into carbide, treating the product with water to form manganous hydroxide, and roasting the latter in an oxidising atmosphere containing steam to convert it into manganese dioxide.—B. N.

(A) *Manganese dioxide; Preparing — [for galvanic cells].* (B), (C) *Galvanic cell.* M. L. Kaplan, Brooklyn, N.Y. U.S. Pats. (A) 1,293,461, (B) 1,293,462, and (C) 1,293,463, 4.2.19. Appl., (A) 4.5.17, (B), (C) 11.7.18.

(A) ARTIFICIAL manganese dioxide is prepared by heating manganese carbonate, treating the residue first to yield a product containing manganese dioxide, and then with nitric acid, and heating the resulting powder to dry it and drive off excess of acid and decompose any manganese nitrate. (B) An electrode material for galvanic cells is prepared by incorporating sufficient nitric acid with manganese peroxide to combine with the basic substances present, decomposing the manganese nitrate formed, and removing the residual nitrates. A conducting material is added to the compound at any convenient stage. (C) An electrode material is prepared by converting manganese carbonate into a product containing a high percentage of the dioxide, a smaller percentage of manganous oxide, and a still smaller percentage of carbon dioxide. The product is treated to remove the carbonic acid and introduce the hydroxide group, the resulting product being oxidised and a conducting material added.—B. N.

Pyrolusite electrodes; Process for regenerating spent —. F. Müller, Vienna. Ger. Pat. 310,866, 20.6.17.

THE electrode is employed as anode in a salt solution through which a current 0.05–0.1 ampere per sq. decimetre of electrode surface is passed for a considerable period. The time during which the current is passed depends upon the amount of material surrounding the carbon core. For very small electrodes, the current is passed for five or six days, medium electrodes require 7 to 12 days, and large electrodes still longer. In no case should large bubbles of oxygen stream off from the electrode.—J. S. G. T.

Electrolytic cell. G. Charbonneau, Le Magnon, France. U.S. Pat. 1,296,046, 4.3.19. Appl., 8.3.17.

THE electrodes consist of alternating right and left hand plates with ends overlapping at the middle of the cell. Terminal members pass through the walls of the cell, and means are provided for clamping the terminals and overlapping ends together.

—B. N.

Battery; Primary —. O. E. Ruhoff, Assignor to French Battery and Carbon Co., Madison, Wis. U.S. Pat. 1,296,700, 11.3.19. Appl., 9.6.17.

A DEPOLARISING mixture for electric batteries contains "deflocculated" conductive material, and some other form of carbonaceous material, the former forming about 20% of the total carbonaceous matter.—B. N.

Electrodes for galvanic cells; Metallic —. R. Boehringer, Potsdam. Ger. Pat. 310,838, 19.9.17.

THE electrode is composed of porous material such as textile fabric, saturated with electrolyte, one face of the fabric being covered by the insoluble electrode metal. With such electrodes the use of gelatin etc. in dry cells is rendered unnecessary. The metal, e.g., zinc, is applied to the fabric by a spraying process, and the uncoated side of the fabric then saturated with electrolyte and tightly pressed against or wound around the carbon electrode. The electrode on account of its pliability is readily adapted to various forms of carbon electrodes, so that the resistance of the cell may be made very small.—J. S. G. T.

Electrical conductors embedded in squirted cellulose; Manufacture of —. V. Planer, Berlin-Lankwitz. Ger. Pat. 308,016, 29.10.16.

CELLULOSE is heated in an oil bath, and then, together with any oil it may retain, is mixed with bitumen to obtain a mass suitable for squirting. The strength of the material is increased by incorporating with the cellulose textile fibres similarly heated in oil before the admixture of bitumen.

—J. S. G. T.

Sodium; Manufacture of electrical conductors of —. L. Luckhardt, Cassel. Ger. Pat. 308,787, 2.6.17.

A THREAD of sodium on emerging from the die is encased by a protective envelope composed of fine threads closely plaited or wound spirally, and is then enclosed within one or more protecting sheaths. The operation is carried out in the absence of air, preferably in a bath of petroleum.—J. S. G. T.

Carbon electrodes; Manufacture of protective sheaths for —, particularly those used in electric furnaces. Ges. für Teerverwertung m.b.H., Duisburg-Meiderich. Ger. Pat. 309,832, 5.6.15.

CARBON electrodes are enclosed in thin sheets of porous material which is unaffected by oxidising gases, and then raised to incandescence. Metals can be used, if all parts of the surface of the electrode are to possess good conducting power. In other cases, quartz, slate, magnesite, carborundum, etc., may be employed. An adhesive or binding material may be used to cause the sheets to adhere to the "unburnt" electrode.—J. S. G. T.

Anodes of solid manganese peroxide; Process for making —. M. Huth, Assignor to Siemens und Halske A.-G., Berlin. U.S. Pat. 1,296,188, 4.3.19. Appl., 3.11.14. Renewed 24.7.18.

SEE Ger. Pat. 282,225 of 1914; this J., 1915, 622.

Electric-arc furnace. J. L. La Cour, Assignor to Norsk Hydro-Elektrisk Kvaelfstofaktieselskab, Christiania, Norway. U.S. Pat. 1,296,194, 4.3.19. Appl., 22.11.15.

SEE Fr. Pat. 480,302 of 1915; this J., 1917, 146.

Electrolysing apparatus. Eng. Pat. 114,623. See VII.

Lampblack. Eng. Pat. 124,557. See XIII.

XII.—FATS; OILS; WAXES.

Coconut and palm oils; Determination of the acidity of —. Vizern and Guillot. Ann. Chim. Analyt., 1919, [ii], 1, 116—119.

IN calculating the acidity of these oils from the amount of alkali used for neutralisation, the factors employed should be the mean molecular weights of the fatty acids of the respective oils. For coconut oil the factor is 208 and for palm oil 222.—W. P. S.

Chrysalis fat; Application of — in the textile industry. G. Tagliani. Färber-Zeit., 1919, 30, 65—67.

LARGE quantities of silkworm chrysalides are obtained each year in Italy. The dried chrysalides contain from 30—40% of extractable fatty matter. The fat is a dark thick oily mass, which on standing separates into about equal parts of solid and liquid. Cold extraction of 1500 grms. of chrysalides with 8500 grms. of benzene gave 575 grms. of fat; hot extraction of the same weight of material with 7500 grms. of carbon tetrachloride gave 620 grms. of fat. The solid and liquid fats are easily saponified. The extracted material is suitable as a cattle food, as a manure, or for briquette making. The application of the soaps or emulsions obtained from these fats in the scouring of cotton and wool has not yet been practically carried out.—L. L. L.

Resin for soap-making. Goldschmidt and Weiss. See XIII.

PATENTS.

Oil; Method of extracting — from vegetable seeds and nuts. C. Downs, R. A. Bellwood, and T. W. Turnill, Kingston-upon-Hull. Eng. Pat. 124,856, 31.1.18. (Appl. 1783/18.)

VEGETABLE seeds and nuts, especially those rich in oil, e.g., copra and palm-kernels, are ground or cut up and subjected to dry heat and agitation, without the addition of water, until a large proportion of the moisture is expelled, and a semi-solid mass is obtained. The exuding oil is separated from this in a centrifugal separator or by means of a filter-press, and the residue is subjected to further expression or extracted with a solvent. The preliminary heating may be carried out in a steam-jacketed conveyor or series of conveyors provided with agitators.—C. A. M.

Oils; Apparatus for treating [deodorising and hardening] —. H. Schlossstein, Chicago, Ill. U.S. Pat. 1,296,013, 4.3.19. Appl., 21.1.18.

AN apparatus for deodorising and hardening oils comprises a vessel with means to effect the circulation of the oil in a closed circuit through the apparatus, and separate means to force a deodorising agent or a hardening agent through the oil in both sides of the circuit so as separately to deodorise and to harden the oil.—A. de W.

[*Hydrogenation of oils*.] *Nickel formate catalyst* [for —], and process of making same. C. Ellis, Montclair, N.J. U.S. Pat. 1,296,496, 4.3.19. Appl., 15.11.17.

NICKEL formate substantially free from catalyst poisons is prepared by dissolving a freshly-precipitated basic nickel compound in formic acid. The formate is dried as far as possible short of blackening and is then ground and heated, with stirring, to 240°–250° C. "in a sealing vehicle" under reduced atmospheric pressure in the absence of a reducing gas, to obtain a catalyst suitable for use in the hydrogenation of oils.—A. de W.

Fatty acids obtained by hydrolysing fats by means of petroleum sulpho acids; *Process of bleaching* —. W. Happach, Malmö, and Sudfeld und Co., Melle, Hannover. Ger. Pat. 310,387, 2.12.13.

FATTY acids obtained by hydrolysis of fats by means of petroleum sulpho acids are bleached by blowing air through them while hot. The use of this process obviates the necessity of preliminary purification of fats before the hydrolysis and of excluding air during the decomposition.—C. A. M.

Soap-like masses; *Manufacture of* —. G. Bethmann, Frankfurt. Ger. Pat. 310,206, 6.6.16.

VASELINE, with or without powdered talc, is kneaded with a solution of glue or other equivalent binding medium, with the addition of alkalis if desired, preferably at 40°–100° C. Plastic masses are obtained which slowly solidify on cooling to products resembling soap.—J. F. B.

Fats or oils; *Process of separating liquid* — from solid fatty materials. W. P. Schuck, and Superior Oil and Process Co., Portland, Oreg., U.S.A. Eng. Pat. 125,327, 4.11.18. (Appl. 18,032/18.)

SEE U.S. Pat. 1,288,223 of 1918; this J., 1919, 186 A.

Distilling apparatus. U.S. Pat. 1,297,590. See III.

Plastic composition. U.S. Pat. 1,295,533. See V.

Fats from wood pulp etc. Ger. Pat. 310,554. See V.

Animal carcasses. Ger. Pat. 309,722. See XV.

Waste products. Eng. Pat. 121,576. See XIXs.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Resins; *Action of alcoholic potash on* —. P. Nicolardot and C. Coffignier. Bull. Soc. Chim., 1919, 23, 200–206.

In each case 1 grm. of the resin was heated for one hour under a reflux condenser with 25 c.c. of N/2 alcoholic potash, and then 50 c.c. of water was gradually added, and the insoluble portion was filtered off and weighed. Of the 27 types of resins examined only one, "Kauri busch récolte," was completely soluble in the N/2 alcoholic potash. The resins could be divided into three classes, namely:—(1) Resins, with which the addition of water neither increased nor decreased the insoluble material. There was only one example found in this class, namely Cameroon resin. (2) Resins with which the addition of water caused a total or partial disappearance of the insoluble matter. With one exception, all the resins in this class were semi-

hard. (3) Resins with which the addition of water caused a more or less marked increase in the insoluble matter. The resins in this class belonged to all three types, hard, semi-hard, and soft. There was no correlation between the acid value of the resin and the amount of insoluble matter it gave in the above test.—W. G.

Resin; *Suitability of German* — for soap-making. F. Goldschmidt and G. Weiss. Z. angew. Chem., 1919, 32, 96. (See this J., 1919, 226 A.)

THE solubility of resin in petroleum spirit affords no useful evidence as to the suitability of the resin for soap-making. As regards the formation of insoluble substances in the presence of trichloroethylene (*loc. cit.*), comparative experiments with carbon tetrachloride showed that with this solvent the useful constituents of the resin remained unaffected when the aeration was carried out in the absence of a catalyst; a slight decrease in the amount of these constituents occurred when iron filings was added.—W. P. S.

Pitches etc. Langton. See III.

PATENTS.

Lampblack; *Manufacture of* —. T. W. S. Hutchins, Middlewich. Eng. Pat. 124,557, 22.3.18. (Appl. 5092/18.)

A DISC or the like adapted to pick up a film of material rotates vertically in a trough of tar or oil, and the resulting film is subjected to the intense heat of one or more electric arcs, whereby it is decomposed, giving a high yield of comparatively pure lampblack. A magnet may be used for directing the arc on to the rotating disc, which may be made of graphite, whilst the process may be carried out in a closed chamber having a pipe connected with a fan at the bottom, through which the gas and lampblack are drawn off. The latter is separated by a bag, or similar filter, whilst the gas is returned to the chamber, whence the excess is drawn off through a valve.—C. A. M.

Printers' roller composition and analogous substances or compositions; *Process for the reclaiming of used* — and apparatus therefor. T. H. Grozier, Longueville, N.S.W. Eng. Pat. 121,941, 28.6.18. (Appl. 10,668/18.) Int. Conv., 3.1.18.

USED printers' roller composition is treated with superheated steam at a low pressure in a closed vessel so as to liquefy and separate the liquefiable portion, whilst the excess of moisture from the composition together with the water of condensation in the apparatus is vaporised to prevent its admixture with the recovered portion. In one type of apparatus claimed, perforated cages are used to separate the liquefiable from the non-liquefiable portion, whilst the vessel has a cover containing a trough with a series of openings to catch the condensed water, and having an opening at the top to allow the steam subsequently produced from this water to escape.—C. A. M.

Dopes; *Manufacture of* —. The British Enamellite Co., Ltd., and J. N. Goldsmith, London. Eng. Pat. 124,515, 25.2.18. (Appl. 2879/16.)

A DOP with increased strength, and in which the toxic properties are reduced or eliminated, is obtained by adding to a cellulose ester solution from about 5 to 100% (on the weight of cellulose ester) of triacetin or acetanilide or a mixture thereof, such addition conferring properties which have hitherto only been obtained by the use of tetrachloroethane or other chloro-hydrocarbons. A

suitable preparation giving a rigid coating on aeroplane wings contains:—Cellulose acetate, 21 grms.; triphenyl phosphate, 1.8 grms.; acetone, 255 c.c.; triacetin, 3 c.c.; and acetanilide, 2.7 grms. The addition of triacetin or acetanilide to a dope containing chloro-hydrocarbons increases the adhesiveness and glossiness of the coating, and gives freedom from white patches.—C. A. M.

Cellulose acetate compositions for use as varnishes, lacquers and for other purposes. A. A. A. Zimmer, J. A. Bryce, and G. L. Davies, London. Eng. Pat. 124,807, 12.4.16. (Appl. 5387/16.)

A non-toxic varnish, particularly suitable as a dope for the wings of aeroplanes, is prepared by mixing together approximately equal parts of cellulose acetate (10 parts) and cresylic acid (10 parts), with acetone, alcohol, benzene, or the like, or a mixture of such solvents (80 parts).—C. A. M.

Shellac; Dissolving and "breaking down" — for use in hat-manufacture and other purposes. T. Mackenzie, Gilberton, S. Australia. Eng. Pat. 124,684, 28.10.18. (Appl. 17,592/18.) Int. Conv., 11.6.18.

A solution of shellac obtained by adding about 6 lb. of common salt to 20 lb. of shellac can be used in much greater dilution than the usual preparations. For example, 20 lb. of shellac is boiled with a solution of 4 lb. of sodium carbonate or borax or equivalent alkaline substance, with or without the addition of rosin, linseed oil, or other "gums" or oils, a solution of 6 lb. of salt added, and then 3 lb. more borax or sodium carbonate, and the boiling continued for about 2 hours, after which the solution is "broken down" to the required consistence by stirring it with cold water.—C. A. M.

Japan; Non-inflammable — and process of making same. W. P. Davey, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,294,422, 18.2.19. Appl., 14.11.17.

ONLY material capable of forming a japan is heated with concentrated alkali until it softens, and the product is diluted with water until a uniform emulsion is obtained, access of air being meanwhile prevented. For example, a japan which can be applied mechanically or by cataphoresis, and which is converted by heat into a hard, adherent coating, consists of an emulsion of a saponifiable oil, asphaltic material, ammonia and water, with or without copal.—C. A. M.

Paint or varnish and paint or varnish ingredient. M. Darrin, Wilkinsburg, Pa., Assignor to H. Koppers Co., Pittsburgh, Pa. U.S. Pat. 1,296,776, 11.3.19. Appl., 29.6.18.

A PAINT or varnish comprises a coal-tar pitch and crude solvent naphtha which has been subjected to an autoclave treatment and to a distillation process.—A. de W.

Printing and stamping colours; Process for the preparation of —. T. Goldschmidt A.-G., Essen. Ger. Pat. 309,911, 15.4.17.

THE application of glycol as hygroscopic agent in the preparation of printing and stamping inks is claimed. Glycol is more hygroscopic than glycerol, and consequently a much smaller quantity of it suffices to keep the printing compositions moist for a long period.—L. L. L.

Paint or varnish and method of making the same. F. W. Sperr, jun., Oakmont, and M. Darrin, Wilkinsburg, Assignors to H. Koppers Co., Pittsburgh, Pa. U.S. Pats. 1,292,907 and 1,292,908, 28.1.19. Appl., 10.8 and 5.11.17.

SEE Eng. Pat. 118,079 of 1917; this J., 1919, 46 A.

Preparing surfaces on canvas etc. Eng. Pat. 124,843. See V.

Resins from wood pulp etc. Ger. Pat. 310,554. See V.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENTS.

Rubber; Process for treating —. J. Porzel, Buffalo, N.Y., U.S.A. Eng. Pat. 124,887, 4.4.18. (Appl. 5758/18.)

By mechanically comminuting old or used vulcanised rubber, then adding rubber solution containing new rubber to the extent of $2\frac{1}{2}$ —3 lb. per 100 lb. of old rubber and further grinding until the limit of practical mechanical division is reached, a mass is obtained, which after the removal of the rubber solvent can be moulded and vulcanised with satisfactory results.—D. F. T.

Vulcanising rubber and similar substances; Method and machine for —. J. Porzel, Buffalo, N.Y., U.S.A. Eng. Pat. 124,888, 4.4.18. (Appl. 5759/18.)

RUBBER and similar substances are vulcanised by a continuous process involving compression of the material between two flat converging surfaces travelling at equal speeds and simultaneously raising the temperature of the material. The converging surfaces consist of two metal belts above and below each of which is arranged a plane rigid heated surface which supplies the heat and imparts the necessary pressure.—D. F. T.

Rubber; Accelerator for the vulcanisation of —. C. R. Boggs, Arlington Heights, Mass., Assignor to Simplex Wire and Cable Co., Boston, Mass. U.S. Pat. 1,296,469, 4.3.19. Appl., 16.3.14.

β -NAPHTHYLAMINE is added to rubber before vulcanisation.—L. A. C.

[Balloon] fabrics. Eng. Pats. 124,494—5. See V.

Fabrics for balloons etc. Eng. Pat. 124,520. See V.

XV.—LEATHER; BONE; HORN; GLUE.

Tannins; Furfural condensation products of — and their use in tannin analysis. R. Lauffmann. Ledertech. Runds., 1918, 10, 97—98. Chem. Zentr., 1919, 90, II., 299—300.

LIKE formaldehyde, furfural gives condensation products with tannins on boiling in hydrochloric acid solution, and the reaction may be used for discriminating between and evaluating various kinds of tannin. The procedure is to boil for half an hour, under a reflux condenser, 50 c.c. of standard tannin solution with 20 c.c. each of 7% furfural solution and 20% hydrochloric acid, the brownish or blackish brown precipitate is collected on a tared filter paper, washed, and dried till of constant weight, and calculated to the basis of 100 part of dry tannin. The "furfural precipitation numbers" thus obtained show close agreement with similar numbers given by formaldehyde precipitation of the same variety of tannin (see this J., 1918, 342 A). If, to the filtrate obtained above, a few drops of 1% iron alum solution and solid sodium acetate are added, a bright green zone

is formed above the latter by protocathechuic tannins, and a violet zone by pyrogallol tannins which is visible when only a small proportion of the latter is present, so that by means of the reaction pyrogallol tannins may be detected in presence of protocathechuic tannins.—G. F. M.

Leather; Extractor for water-soluble in — H. C. Reed and J. B. Churchill. J. Amer. Leather Chem. Assoc., 1919, 14, 133–140.

In a large cylindrical copper container, 15 in. deep, are fitted 12 glass tubes 9 in. long, each closed at the top by a one-hole rubber stopper and narrowing at the bottom into a small tube which, passing through a stopper in the bottom of the container, is attached to a rubber tube leading to a flask which receives the extract. The leather sample is placed between two layers of absorbent cotton, the tubes are two-thirds filled with distilled water, the pinch-cocks on the rubber tubes closed, and the apparatus is allowed to stand over-night. It is then filled with distilled water and brought to 50° C. The percolation is started and for each drop of extract leaving the tube a drop of water is forced to enter through the hole in the rubber stopper owing to the slight vacuum created. The results obtained by this extractor are somewhat higher than by others, probably due to the leather being completely surrounded with water at 50° C.—D. W.

Leather; Extraction of grease and oil from — J. A. Wilson. Report of a committee of the American Leather Chemists' Association. J. Amer. Leather Chem. Assoc., 1919, 14, 140–178.

EXTRACTIONS were made on 15 samples of leather ranging from shoe upper to sole leather and including chrome, vegetable, and combination tannages both fat-liquored and stuffed. Five solvents were tried on each leather and it was shown that the order of relative efficiency was chloroform, ether, carbon tetrachloride, carbon bisulphide, petroleum spirit. Analyses of leather fat-liquored with moellon degreas containing 15% of oxidised fatty acids on the total fatty matter showed 22.28% of fat with petroleum spirit and 27.32% with chloroform. Petroleum spirit extracted 5.93% of fat and chloroform 9.80% from a chrome-tanned kip fat-liquored with sulphonated oil. Clearly petroleum spirit is unable to remove oxidised fatty acids and certain portions of sulphonated oil from leather containing them. The committee conclude that chloroform is the most efficient and they recommend it as the official solvent.—D. W.

Leather; Effect of grease on the tensile strength of strap and harness — L. M. Whitmore, R. W. Hart, and A. J. Beck. J. Amer. Leather Chem. Assoc., 1919, 14, 128–133.

THE tensile strength of strips of leather cut from the backs of 52 different tannages was determined as received, after degreasing, and again after restuffing with different mixtures.

	Samples	Relative tensile strength	Percentage of grease
As received	...	114.8	13.7
Degreased	...	100.0	0.0
Re-stuffed with petrolatum and paraffin mixture, m.pt. 42°C.	...	119.5	28.0
Re-stuffed with tallow	...	108.4	28.0
"	{ 30 tallow ... }	119.9	26.2
"	{ 30 cod oil ... }		
"	{ 20 wool grease ... }		
"	{ petrolatum ... }		
"	{ rosin ... }	113.9	21.4
"	{ mineral oil ... }		

The increase in the tensile strength due to the presence of grease is probably attributable to the lubrication and strengthening of the fibres. Tests with increasing amounts of petrolatum showed that 14% of grease is quite sufficient to ensure perfect lubrication and maximum tensile strength.—D. W.

PATENTS.

Animal carcasses; Apparatus for the utilisation of — [for recovery of glue, fat, etc.]. H. Goslar, Aachen. Ger. Pat. 309,722, 14.12.17. Addition to Ger. Pats. 308,152 and 308,753 (this J., 1919, 23 A, 189 A).

At the edge of the heating plate on the under side of the floor two adjacent chambers in connection with supply and exhaust conduits for compressed air are arranged, into which several superposed annular channels surrounding the heating plate open. A good utilisation of the heat stored up in the heating plate is thus ensured and the drying of the flesh meal on the floor of the apparatus is considerably accelerated. Moreover, more heat is withdrawn from the heating plate at the edges, i.e. from the place where the meal chiefly lies during the drying, so that damage due to overheating of the product is less liable to take place. Further, it is possible to measure the temperature of the air leaving the plate and thus to regulate the temperature of the plates themselves.—J. F. B.

Leather imitations. U.S. Pat. 1,295,148. See V.

Dyeing for skins. Ger. Pat. 310,425. See VI.

XVI.—SOILS; FERTILISERS.

Lime, magnesia and potash in such minerals as epidote, chrysotile, and muscovite; Solubility of —, especially in regard to soil relationships. R. F. Gardiner. J. Agric. Res., 1919, 16, 259–261.

THE minerals were finely powdered and from 0.1 to 1.0 gm. of the fine powder was, in each case, left in contact with 25 c.c. of a slightly acid soil extract for two months at 25° C. It was found that, on the average, 1.0% of the total lime in the epidote, 0.21% of the total magnesia in the chrysotile, and from 11 to 21% of the total potash in the muscovite was dissolved.—W. G.

Cyanamide and dicyanodiamide; Decomposition of — in the soil. G. A. Cowie. J. Agric. Sci., 1919, 9, 113–136.

FIELD trials with barley, pot cultures with mustard, barley, and rye, and laboratory experiments on soil bacteria were made to determine the behaviour of cyanamide and dicyanodiamide in soil. It was found that cyanamide increased plant growth, being decomposed with formation of ammonia which underwent nitrification. The decomposition is slower than that of ammonium sulphate, owing to the time required for the conversion of the cyanamide into ammonia. Dicyanodiamide underwent no decomposition. It had a depressing effect on plant growth; in large quantities it was toxic, and in small quantities it failed to produce any stimulation. Using mixtures of the two substances, it was found that dicyanodiamide had no harmful effect on the ammonification of cyanamide, but it prevented nitrification. Using 3 parts of cyanamide and 1 part of dicyanodiamide, only 22% of the nitrogen was nitrified, and with 1 part of cyanamide and 3 parts of dicyanodiamide, only 5%. In these cases, however, the plant utilised much

of the nitrogen that had not been nitrified. Dicyanodiamide only slightly retarded the rate of ammonification of protein, but the nitrification of ammonium sulphate was reduced almost to nothing. The total number of soil bacteria growing on gelatin was not affected. (See also J. Chem. Soc., June, 1919.)—J. H. J.

Cellulose; Decomposition of — [in soil] by an aerobic organism (*Spirochaeta cytophaga*, n.sp.). H. B. Hutchinson and J. Clayton. J. Agric. Sci., 1919, 9, 143—173.

INOCULATIONS of Rothamsted soil into a mineral culture solution containing a strip of filter paper gave rise under aerobic conditions to the growth of a curved thread organism which resembled the spirochetes rather than the bacteria and was named *Spirochaeta cytophaga*. In old cultures the threads change into an oval or spheroidal form and resemble spores. Its optimum temperature is 30° C., but it does not grow on the ordinary media, growth being inhibited by 0.25% of peptone. It grows best in a solution of nutritive salts with cellulose and simple nitrogenous substances, such as nitrates, ammonium salts, amides, and amino-acids in low concentration. All carbonaceous compounds except cellulose are inhibitory to growth. Cellulose in any form is rapidly decomposed at 25°—30° C., producing a mucilage which is of a pectin character. When a cellulose culture of the organism was added to a mannitol culture of *Azotobacter*, an increased fixation of nitrogen was observed.—J. H. J.

Superphosphate; Absorption of ammonia by —: "ammonium superphosphate." C. Briquex. Comptes rend. Acad. d'Agric. de France, 1918, 4, 632—638. Bull. Agric. Intell., 1918, 9, 1413—1414.

CALCIUM superphosphate has been made in Germany during the war with the aid of sodium bisulphate obtained as a waste product from explosives works. This superphosphate has been used to absorb ammonia obtained from sewage, gas-liquor, and cyanamide, the product being called ammonium superphosphate. When calcium superphosphate is treated with ammonia gas, ammonium sulphate and tricalcium phosphate are formed. Analysis of the product gave: total P_2O_5 , 15.8%; P_2O_5 soluble in ammonium citrate, 13.1%; P_2O_5 soluble in 2% citric acid, 14.1%; P_2O_5 soluble in water 1.53%; ammoniacal nitrogen, 4.97%.—J. H. J.

Nitrogenous fertilisers; Possibility of obtaining — by utilising waste materials for the fixation of nitrogen by nitrogen-fixing bacteria. C. I. T. Doryland. Abs. Bacteriol., 1918, 2, 2. Bull. Agric. Intell., 1918, 9, 1413.

MOLASSES, orange, lemon and grape-fruit juices, and straw were found to serve as sources of energy for nitrogen-fixing bacteria. Nitrogen may be fixed by bacteria more economically than by chemical methods. The essential conditions for this result are the use of waste materials as sources of energy, symbiotic bacteria of active nitrogen-fixing strains, mechanical manipulation, and evaporation by solar heat.—J. H. J.

PATENT.

Peat; Treatment of — for making useful products [manure, fodder, etc.]. W. B. Bottomley. London. Eng. Pat. 124,629, 21.5.18. (Appl. 8434/18.) (See also this J., 1917, 95, 614.)

A LAYER of peat is alternately sprinkled with a 5–10% solution of sodium chloride and turned over, until either 2% or 10% of salt has been absorbed.

It is then transferred to a tank into which steam is blown under 60 lb. pressure, until the temperature is slightly above 100° C. The peat treated with 10% of salt is now ready to be used for the extraction of nucleic acid. The peat treated with 2% of salt is used as a manure or a feeding stuff. To enhance its value it is inoculated with ammonia-producing and nitrogen-fixing organisms, and kept at 26°—28° C. for 3 days. Before use as a feeding stuff it is sterilised in the steam tank at 120° C. To produce a phosphatic manure, finely ground mineral phosphate is added before inoculation.

—J. H. J.

XVII.—SUGARS; STARCHES; GUMS.

Furfuroids (furfurosans); Determination of — in products of beet-sugar factories. R. Gillet. Bull. Assoc. Chim. Sucr., 1918, 35, 93—102.

IN continuation of previous work (this J., 1918, 345 A), it has been found that in the determination of pectic substances in beet-sugar factory products by the Tollens-Couder procedure, satisfactory results are obtained by first destroying the hexose sugars by fermentation, after which the liquid is distilled with hydrochloric acid, and the phloroglucide precipitated and weighed in the usual manner. The amount of pentosans and "pectic substances" in beet molasses, per cent. of the non-sugars present, was found to average 2.10 and 6.76 respectively. In first and second grade sugars, the proportions were considerably higher, from which the author concludes that a large part of the so-called furfuroids, or furfural-yielding substances, present in the clarified syrups are retained by the sugar after drying in the centrifugals.—J. P. O.

Aldose sugars; Determination of — by titration with iodine in alkaline medium. H. Colin and O. Liévin. Bull. Assoc. Chim. Sucr., 1918, 35, 107—110.

IN using Bongault's method of determining aldose sugars by oxidation with iodine (this J., 1917, 899), the secondary reaction can be inhibited sufficiently to obviate the necessity of making a series of readings, by carrying out the oxidation in the presence of sodium bicarbonate or potassium iodide, or, preferably, a mixture of sodium carbonate and sodium hydrogen phosphate. In the determination of dextrose in admixture with levulose, for example, to every 10 c.c. of N/10 iodine solution used, 25 c.c. of a solution containing 50 c.c. of N/1 sodium carbonate and 35 grms. of sodium hydrogen phosphate per litre is added. The iodine (using three times the amount corresponding to the dextrose present) and alkaline phosphate solutions should be added to the neutralised sugar solution contained in a flask, which is immediately well stoppered. At the end of an hour, an aliquot portion of the liquid is removed, acidified, and titrated with N/100 thiosulphate. Determinations of dextrose in the presence of levulose by this method gave results in close agreement with those calculated from the cupric-reducing value and optical rotation.—J. P. O.

Reducing sugars; Volumetric determination of — by Schindler's modification of Bertrand's method. Bettinger. Bull. Assoc. Chim. Sucr., 1918, 35, 111—113.

BERTRAND'S volumetric method of determining reducing sugars (this J., 1907, 60), in which the precipitated cuprous oxide is dissolved in ferric sulphate solution and the liquid titrated with permanganate, has been rendered more rapid by using the same flask throughout and by replacing the

filter-tube by a Gooch crucible. Reduction is effected in a conical flask, and the cuprous oxide washed quickly by decantation through a Gooch crucible provided with an asbestos pad. Standardised ferric sulphate solution is added to the precipitate remaining in the reduction flask, which is immediately connected by means of a rubber stopper and funnel with the Gooch crucible, and also with a tube leading to a filter-pump. A further known volume of the ferric sulphate solution is added to the Gooch crucible to dissolve the cuprous oxide remaining on the asbestos pad, and the liquid is drawn into the flask. After washing with warm water, the solution is titrated with permanganate. —J. P. O.

Glucose [dextrose] and fructose [levulose]; Mutation of —. J. M. Nelson and F. M. Beegle. J. Amer. Chem. Soc., 1919, 41, 559–575.

New values have been determined for the specific rotation of α -glucose, β -glucose, and β -fructose; these are respectively $+111.2^\circ$, $+17.5^\circ$, and -130.8° . The values are the same at the temperatures 0.15°C ., 15°C ., 25°C ., and 37°C .. The equilibrium rotation of glucose is not affected by temperature, but that of fructose varies with the temperature of the solution, and it is concluded that the mutation of glucose is due simply to racemisation, whilst that of fructose is not. (See also J. Chem. Soc., June, 1919.)—J. F. S.

"Artificial honey" [invert sugar, its examination and manufacture in Germany]. A. Behre and H. Ehrecke. Chem.-Zeit., 1919, 43, 153–155.

Owing to the variable consistence of invert sugar sold as artificial honey, it has been stipulated in Germany that the product should be supplied in the solid form. The liquid state is due sometimes to a high water content, but more usually to incomplete hydrolysis of the sucrose. Samples containing 20% of water and 5% of sucrose were always solid, but when the amount of sucrose was above 15% they were liquid. Generally the water content was fairly constant, viz., 17–20%, but the sucrose content fluctuated between 2 and 60%. Laboratory experiments showed that solid invert sugar is obtainable when hydrolysis is effected by dissolving 50 grms. of sucrose in 15 c.c. of water, and hydrolysing by heating with at least 0.05% of hydrochloric acid, or 0.10% of formic acid, for half-an-hour at 80° – 85°C .. In the factory, products of constant composition were obtained with closed steam-jacketed converters provided with stirrers, ordinary open boiling pans proving much less satisfactory. —J. P. O.

PATENTS.

Decolorising-carbon. Eng. Pat. 125,230. See IIb.

Fermented molasses. Eng. Pat. 124,364. See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Cholam (Andropogon Sorghum) as a substitute for barley in malting operations. B. Viswanath, T. L. Row, and P. A. R. Ayyangar. Mem. Dep. Agric. India, 1919, 5, 117–129.

CHOLAM or great millet is better suited for malting purposes than various other common South Indian cereals investigated and cholam malt extract hydrolyses soluble starch at a greater rate than barley malt extract, the ratio of dextrin to sugar being greater with cholam than with barley malt. The products of the hydrolysis consist largely of maltose and dextrin.—T. H. P.

Alcoholic fermentation; Changed course of — in an alkaline medium. A. Oelsner and A. Koch. Z. physiol. Chem., 1919, 104, 175–181.

ALCOHOL and carbon dioxide are produced when dextrose is fermented in an alkaline phosphate medium. The fermentation is delayed. This does not confirm Wilenko (this J., 1917, 1283) who stated that no carbon dioxide was produced under these conditions. (See further J. Chem. Soc., June, 1919.)—J. C. D.

Bacterium; Water — living in bitter wines that can dehydrate glycerol; glycerol-reaction. E. Volzenet. Ann. Inst. Pasteur, 1918, 32, 476–510. Bull. Agric. Intell., 1918, 9, 1489–1490.

A BACTERIUM was isolated from water which had the property of converting glycerol into acrolein. The organism was identical with one previously isolated from wine affected with "bitter disease." It is considered that wine becomes infected through water containing the organism gaining access to it. On inoculation into a vinous medium the organism isolated from water produced acrolein, which is characteristic of "bitter disease." The organism was named *Bacillus amacrylus*. It is capable of growing in 1% phenol broth at 42°C .. In many of its reactions it resembles Escherich's bacillus. A special reaction is described called the "glycerol-reaction," depending on the production of acrolein from glycerol, which can be used to distinguish *B. amacrylus* from other organisms in water. —J. H. J.

Wine; Detection of cider etc. in —. C. Schätzlein. Z. Unters. Nahr. Genussm., 1918, 36, 253–261.

A REACTION described by Medinger and Michel (cider giving a brown coloration with sodium nitrite solution whilst genuine wine remains bright yellow; see this J., 1918, 386 A) is found by the author to be unreliable.—W. P. S.

Cider. W. I. Baragiola, O. Schuppli, F. Braun, and J. B. Kléber. Z. Unters. Nahr. Genussm., 1918, 36, 225–253.

ANALYSES of 28 samples of cider are recorded. The alcohol content varied from 32.5 to 51.8; total solids, 17.0 to 29.0; invert sugar and sucrose, 0.33 to 7.9; ash, 2.37 to 3.28 grms. per litre; total acid, 55 to 90 c.c. N/1 per litre. The amount of volatile acids was not more than that found in wines, whilst the amount of non-volatile acids was less than 2 grms. per litre. About one-half of the amount of lactic acid in the ciders was present in the combined state: citric acid was absent. The "unidentified" acid stated by Schulte (this J., 1919, 114 A) to be present in wine is probably lactic acid.—W. P. S.

Utilisation of the root of Anthriscus sylvestris (cow-parsley). H. Colin. Bull. Assoc. Chim. Sucr., 1918, 35, 106–107.

ANALYSIS of the root of cow-parsley (*Anthriscus sylvestris*) showed its carbohydrate content to be: starch, 14.5; sucrose, 5.64, and reducing sugars, 0.96%. The roots are not suitable as cattle food, owing to the disagreeable odour; but they might advantageously be utilised for the production of alcohol. *Anthriscus* is a biennial, its carbohydrate content being highest at the end of the first year. —J. P. O.

Methyl alcohol [in ethyl alcohol]; Detection of —. E. Salkowski. Z. Unters. Nahr. Genussm., 1918, 36, 262–270.

A TEST for methyl alcohol depends on its oxidation, and detection of the resulting formaldehyde. The ethyl alcohol to be tested is diluted with 9 vols. of water and 0.5 c.c. of this mixture is treated with

3 c.c. of dilute sulphuric acid and 3 c.c. of 1% potassium permanganate solution. After 8 mins., the solution is decolorised with saturated oxalic acid solution, distilled, and the distillate heated to boiling with the addition of 0.08 gm. of peptone, 3 drops of 3% ferric chloride solution, and its own volume of hydrochloric acid (sp. gr. 1.19). If the original alcohol contained as little as 1% of methyl alcohol, a bright violet coloration develops. This, and other tests which are based on the formation and detection of formaldehyde are reliable when dealing with methyl and ethyl alcohols alone, since the latter does not yield formaldehyde on oxidation. Higher alcohols, such as propyl, isobutyl, and isoamyl alcohols, yield distinct traces of formaldehyde when treated as above, and the presence of these alcohols in commercial ethyl alcohol might lead to the erroneous conclusion that methyl alcohol was present. In the deliberate adulteration of alcohol with methyl alcohol, quantities of less than 10% of the latter are not likely to be used; the strong coloration given by this proportion of methyl alcohol would be almost conclusive evidence of adulteration since the colorations yielded by the small quantities of higher alcohols which might be present in ethyl alcohol would be much less intense.

—W. P. S.

Spirits; Detection of renatured alcohol in — L. Wolfrum and J. Pinnow. Z. Unters. Nahr. Genussm., 1918, 36, 270—273.

THE removal of pyridine from denatured alcohol is not a difficult matter; the resulting spirit would still contain methyl alcohol, acetone, allyl alcohol, empyreumatic substances, etc., but it is possible that it might be used to adulterate brandy etc. Fendler and Mannich's reaction (conversion of the methyl alcohol into formaldehyde and detection of the latter by means of morphine dissolved in concentrated sulphuric acid) may be used for detecting the presence of such renatured alcohol, since it will indicate with certainty 6% of methyl alcohol in ethyl alcohol. If ethyl alcohol containing a small percentage of methyl alcohol is distilled until its volume is reduced to one-half, the distillate will contain 70% of the methyl alcohol.—W. P. S.

Glycerin; Production of — from sugar by fermentation. Report of Chemistry Division of the U.S. Bureau of Internal Revenue, May 8, 1918.

Of a number of yeasts examined, the Steinberg variety of *Saccharomyces ellipsoideus* is found to give the highest yields of glycerol, into which 20–25% of the total sugar originally present is converted under the most favourable conditions. The latter vary somewhat with the nature of the saccharine liquor employed. The sugar solution should be rendered alkaline by addition of 5% of sodium carbonate, the alkali being introduced in the solid state and in portions as large, and as frequently, as the yeast is able to withstand. The yeast is previously acclimatised to sodium carbonate. A vigorous fermentation should be maintained throughout; a little ammonium chloride appears to help in this direction. The most favourable temperature is 30°–32° C., and the concentration of sugar should be 17.5–20 grms. per 100 c.c. The results of several experiments on a commercial scale are given. (See also this J., 1919, 175 B.)—T. H. P.

Methyl alcohol and denatured alcohol [in milk analysis]. Prescher. See XIXA.

Methyl and ethyl alcohols. Sabalitschka. See XX.

PATENTS.

Yeast; Extraction of — from fermented molasses. L. J. P. M. J. Dupire, Ramecourt, France. Eng. Pat. 124,364, 27.7.18. (Appl. 12,255/18.) Int. Conv., 22.3.18. Addition to Pat. 123,711 (this J., 1919, 334 A).

IN the centrifugal separation of yeast from fermented molasses, the separated yeast is washed by adding it to highly diluted molasses of density 0.5° B. (sp. gr. 1.003) kept at 31° C., and containing 0.1 gm. of sodium phosphate per litre. When fermentation commences, the mixture is centrifuged at a high speed. The separated yeast is thus obtained in a clear liquid of low density, and is very active.—J. H. J.

Proteolytic enzymes; Process of producing an extract of — T. Muto, Kobe, Assignor to Kanegafuchi Boseki Kabushiki Kwaisha, Tokyo-Fu, Japan. U.S. Pat. 1,296,600, 4.3.19. Appl., 14.12.18.

COCOON-FORMING insect material is digested with a solution containing sodium chloride at a temperature below 50° C., an antiseptic is added, and the solution is separated from the undissolved matter, and treated for the recovery of the enzyme therein.

Proteolytic enzymes; Process for producing an extract of — T. Muto, Kobe, Assignor to Kanegafuchi Boseki Kabushiki Kwaisha, Tokyo-Fu, Japan. U.S. Pat. 1,296,599, 4.3.19. Appl., 25.4.17.

SEE Eng. Pat. 106,504 of 1917; this J., 1918, 437 A.

XIXA.—FOODS.

Wheat kernel and its milling products; Nutritive value of — T. B. Osborne and L. B. Mendel. J. Biol. Chem., 1919, 37, 557—601.

THE proteins of the wheat kernel as a whole possess a relatively high nutritive value. Those of the bran are, when utilised, slightly superior to those of the embryo, which are superior to those of the endosperm. The water-soluble vitamins appear to be localised in the endosperm, not in the embryo. No confirmation of the presence of a toxic substance in wheat was obtained. The question of the degree to which it is desirable to mill flour for general use is discussed. (See further J. Chem. Soc., June, 1919.)—J. C. D.

Meat; Chemistry of spoiled — K. G. Falk, E. J. Baumann, and G. McGuire. J. Biol. Chem., 1919, 37, 525—546.

THE action of certain organisms, isolated from meat which was suspected of causing poisoning, on meat and a meat extract was studied. In every case the ammonia nitrogen showed an increase. *B. coli*, *B. enteritidis*, *B. subtilis*, and *Streptococcus brevis* cause a decrease in the creatine-creatinine value. *B. proteus* and *B. paratyphosus* β cause a slight decrease of purine nitrogen, but *B. subtilis* and *Streptococcus brevis* bring about an increase.—J. C. D.

Meat; Ammonia test for spoiled — K. G. Falk and G. McGuire. J. Biol. Chem., 1919, 37, 547—550.

THE aeration method described by Folin and Bell (J. Biol. Chem., 1917, 29, 329; this J., 1917, 572) is used to estimate the ammonia present in meat. When meat decomposes at the ordinary temperature (15°–25° C.) it becomes unfit for food when the

ammonia nitrogen content reaches 0.3–0.4 mgrm. per grm. of meat. At low temperatures the ammonia figure may be much higher, 1–3 mgrms. per grm. of meat, before the meat is unfit.—J. C. D.

Drying processes of to-day [for foodstuffs]. R. Schmidt. *Z. angew. Chem.*, 1919, **32**, 108–113.

AN outline is given of the various methods used for drying natural and artificial products. The accepted belief that drying *in vacuo* is cheaper and more rapid than drying in air has not been definitely proved. In the case of fruit and vegetable products reduction of the moisture to 8–12% is sufficient to obtain a stable preparation, and better results are obtained when the humidity of the air used in the drying is not allowed to fall below a definite degree. Discoloration of the product takes place not only towards the end of the drying but also through oxidation when the material is first cut up. To prevent this a short boiling or steaming ("blanching") is necessary, or preservation of the material in salt water or suitable acid solutions. All vegetables, with the exception of spinach, must be "blanched" to destroy enzymes. Steaming for 10 minutes does not effect any material change in the composition, whilst the same effect can be obtained by immersing the sliced vegetable in boiling water for not more than 1 to 2 mins., but immersion for 5 to 6 mins. causes a material loss of nutritive constituents. "Sulphuring" immediately after slicing will also protect potatoes etc. from discoloration. In processes in which the products of combustion from a coke fire and air are passed through the material to be dried, the sulphur dioxide in the gases improves the colour of the final product. Only about 0.0125 grm. of SO₂ per 1 cb. m. of the mixture of air and gases comes in contact with the material, and the permissible (German) limit for sulphur dioxide in dried vegetables and fruits is 0.125%.—C. A. M.

Tin-plate containers [for foodstuffs]; Substitutes for —. Advisory Council of Sci. and Ind., Commonwealth of Australia, Bull. No. 10, 1919, 78 pages.

OWING to the war, a shortage of tin-plate for making containers for foodstuffs arose in Australia and an inquiry was held into what local materials could be used as substitutes. Cardboard was found to be the most suitable. For holding liquids and hygroscopic solids, it is necessary to treat the containers with a waterproofing material. Investigation was made into the properties of metallic films, waxes, casein, viscose and synthetic resins as waterproofing materials, and it was found that paraffin wax was successful, except that it was acted upon by oily and spirituous substances. For these substances it was found necessary to use a synthetic resin. The best resin was made as follows: 4 vols. of carbolic acid, 3 vols. of formalin, and $\frac{1}{2}$ vol. of concentrated ammonia are boiled under a reflux condenser until separation into two phases takes place; steam and volatile bodies are then distilled off, when the residue separates into two layers, an upper aqueous layer and a lower oily layer. The upper layer is removed and the lower boiled with fresh water several times. The washed oily resin is dissolved in half its volume of warm methylated spirit or rectified spirit. For use, the resin is diluted with alcohol to the consistency of linseed oil. The name of "magramite" was given to this varnish. The cardboard containers are sized, dipped in magramite, allowed to dry, and heated at 130° C. for 3 hrs. If the containers are not to be used for foodstuffs nor oily substances, the final heating may be omitted. The magramite containers were tested with jam and condensed

milk, and were found to be unacted upon and the foodstuffs to be without any acquired odour.

—J. H. J.

Methyl alcohol and denatured alcohol; Use of — in place of ethyl alcohol [in milk analysis]. J. Prescher. *Z. Unters. Nahr. Genussm.*, 1918, **38**, 286–287.

THE use of methyl alcohol in place of ethyl alcohol in the Rose-Gottlieb method for determining fat in milk etc. is not recommended owing to the imperfect separation of the ethereal and aqueous layers of liquid obtained in the process. Provided that it has been distilled from alkali and is neutral, denatured alcohol may be used in place of ethyl alcohol for determining the freshness of milk by methods which depend on the quantity of alcohol required to coagulate the milk.—W. P. S.

Palm kernel and other feeding cakes; Rancidity of —. J. R. Furlong. *J. Agric. Sci.*, 1919, **9**, 137–142.

FRESHLY prepared palm kernel cake has a characteristic odour due to a trace of volatile fatty acid being liberated during manufacture. On storing the cake in presence of moisture, it becomes rancid, owing to an increase in the volatile fatty acids which have an unpleasant odour. This increase in acidity was investigated in the case of palm kernel oil and was found not to be due to bacteria nor to hydrolysis, but to lipase. The action did not take place if the kernels were kept dry. Palm kernel cake and meal developed less acidity than some other oil cakes, such as cotton seed, linseed, coconut, etc., but in the case of the latter the acidity was not due to the production of volatile acids.

—J. H. J.

Coconut globulin and coconut press-cake; Nutritive value of —. C. O. Johns, A. J. Finks, and M. S. Paul. *J. Biol. Chem.*, 1919, **37**, 497–502.

NORMAL growth was shown by rats fed upon artificial diets in which the sole source of protein was coconut globulin. This is in agreement with the observation that this protein contains all the amino-acids known to be essential for growth (*J. Biol. Chem.*, 1919, **37**, 149). Good growth was shown by rats fed upon a diet containing 75% of coconut press-cake, in spite of the relatively low protein content of the diet (13.1%). These experiments show that coconut press-cake has a high nutritive value. The cake contains an adequate amount of the water-soluble vitamins, but an insufficient quantity of the fat-soluble vitamins, for the nutrition of the growing rat.—J. C. D.

Straw fodder; Preparation of — without using heat. E. Beckmann, O. Liesche, H. Netscher, and K. Platzmann. *Z. angew. Chem.*, 1919, **32**, 81–82.

THE straw is treated with about 8 times its weight of 1% sodium hydroxide solution for about 48 hrs. at the ordinary temperature, and is then washed. If desired, the sodium hydroxide may be replaced, after a time, by a further quantity, the first solution being treated with a quantity of sodium hydroxide sufficient to bring its alkalinity up to 1%, and then used for extracting a fresh charge of straw. The treated straw tends to become acid in reaction if kept for some time in a moist state.

—W. P. S.

PATENTS.

Meal or flour and milling products; Treating —. E. C. Sutherland, Deventer, Holland. Eng. Pat. 121,943, 12.9.18. (Appl. 14,863/18.) Int. Conv., 2.1.18.

IN order to render inert the enzymes in flour which are capable of destroying hydrogen peroxide, a

small quantity of chlorine or of a substance containing active chlorine is added to flour, which is then treated with a peroxide by the process described in Eng. Pat. 102,967 (this J., 1918, 71 A).
—J. H. J.

Flour; Treatment of — H. Greville, Birkenhead. Eng. Pat. 124,298, 3.4.18. (Appl. 5671/18.)

To impart a slight acid reaction to dough made from wheaten flour, a mixture of $\frac{1}{4}$ oz. of hydrogen peroxide (10 vols.) and 4 oz. of an acid substance, such as phosphoric acid (50%), is added to the water used in making the dough from a sack of flour. In the case of acid flours calcium peroxide may be used in the mixture.—J. H. J.

Eggs; Treating powdered or other dried — to render them emulsifiable. W. Crossley, London. Eng. Pat. 124,968, 13.6.18. (Appl. 9736/18.)

In order to render dried granulated egg and coagulated liquid egg emulsifiable with water, they are submitted to enzyme action. The enzymes used are pancreatin, 18 parts, in an alkaline medium, pepsin, 25 parts, in an acid medium, or papain, 25 parts, in an acid, alkaline, or neutral, medium, at 40° C.; or diastase, 35 parts, in an acid or neutral medium at 50° C., to 5000 parts of egg and 10,000 parts of water.—J. H. J.

Food products; Method of manufacturing — from fruits and vegetables, and the products. P. R. Welch, Assignor to The Welch Grape Juice Co., Westfield, N.Y. U.S. Pat. 1,295,943, 4.3.19. Appl. 31.8.17.

For the preparation of fruit and vegetable products, the juice is separated from the pulp, concentrated, again added to the pulp, and the mixture heated.
—L. A. C.

Desiccating fluids [milk]; Apparatus for and method of — C. E. Rogers, Detroit, Mich. U.S. Pat. 1,297,496, 18.3.19. Appl. 8.5.15.

MILK or other liquid is concentrated at 140°–145° F. (60°–63° C.) and applied in a thin film to a rotating cylinder which is subjected to a current of air at a temperature not above 145° F. (63° C.). The partly dried film is removed from the cylinder and subjected to the same current of air till dry, when it is passed through a "tumbler" having a screen of the desired mesh through which it is discharged.—W. F. F.

Fodder from corn-cockle seeds; Process for preparing a — K. Hornbogen, Klotzsche. Ger. Pat. 309,987, 1.7.17.

THE seeds are steeped for several days at a low temperature and with exclusion of air in water which is changed several times, then rapidly dried, at first with a strong current of air at 50°–60° C. and afterwards at 90°–110° C. The germination of the seed is inhibited by the low temperature of the steeping water and the exclusion of air, and the poisonous saponin is washed away. If the seeds contain no more than about 30% of vetch it is not economical to separate the vetch. Such a mixture is best treated by the addition of about 0.25% of alkali to the steeping water.—J. F. B.

Animal carcasses. Ger. Pat. 309,722. See XV.

Treating peat. Eng. Pat. 124,629. See XVI.

XIXb.—WATER PURIFICATION; SANITATION.

Water; Significance of B. coli in judging the character of — E. Quantz. Diss., Göttingen, 1915. Chem. Zentr., 1919, 90, II., 158–159.

From results obtained in tests for *B. coli*, in comparison with observations of the source of supply and the ordinary bacteriological and chemical examination of water, the following conclusions have been drawn:—The occurrence of *B. coli* in water indicates surface contamination or insufficient filtration. A large number of bacteria in the water does not necessarily indicate pollution, as does the presence of *B. coli*. On the other hand, failure to detect *B. coli* is not a certain proof of the purity of well water. All that can be said is that, if, on repeated examination, even after heavy rain-fall, no *B. coli* is found, the water cannot be polluted to such a degree as to be immediately dangerous. The presence of *B. coli* is not conclusive proof of faecal contamination; hence percolations which have introduced that organism into the water, need not also have introduced typhus bacilli. In general, it may be assumed that the more numerous the *Coli* bacilli in water, and the more typical their behaviour in producing acid, the closer to the well is the source of pollution, and the more dangerous must the water be considered. The *B. coli* test is a valuable adjunct to an examination of the source of a water supply, but is not a substitute for it. It is also a good indicator of insufficient filtration, but, here again, certain proof of dangerous pollution can only be obtained by an examination of the deposit.
—C. A. M.

Dakin's solution; Stabilisation of dilute sodium hypochlorite solutions. G. E. Cullen and R. S. Hubbard. J. Biol. Chem., 1919, 37, 511–517.

DAKIN'S solution for clinical use may be efficiently stabilised by means of buffer salts (carbonates or borates) or by small amounts of sodium hydroxide. (See further J. Chem. Soc., June, 1919.)—J. C. D.

Dakin's solution; Electrolytic preparation of — G. E. Cullen and R. S. Hubbard. J. Biol. Chem., 1919, 37, 519–523.

THE curve representing the production of sodium hypochlorite per unit of time has an optimum point which may be raised by raising the initial temperature of the brine, the current being maintained constant at 20 amps. An increase in the concentration of the brine results in an increased production of sodium hypochlorite per unit time. More concentrated solutions than the 6% often recommended may be used, and with them higher concentration of hypochlorite and increased current efficiency may be obtained. It is pointed out that cells should not be operated beyond the peak of the production curve. The solution, as it comes from the cell, decomposes quickly and must be stabilised (see preceding abstract).—J. C. D.

Alkali hypochlorite solutions. Fonzes-Diacon. See VII.

Water bacterium. Voisenet. See XVIII.

PATENTS.

Distilled water; Process for the production of — in power plant, more particularly steam turbine plant. E. Josse and W. G. Gensecke, Berlin. Ger. Pat. 305,381, 21.6.14.

THE still is contained within the exhaust steam-conduit of the power plant, or in a branch thereof, and a higher vacuum is maintained therein than

in the principal condenser. The steam is distilled into a special condenser cooled by water at a lower temperature than that used in the principal condenser, so that a higher vacuum is maintained in the former than in the latter. In this manner the distillation may be effected by the waste heat of the turbine plant.—J. S. G. T.

Sewage sludge; Process and plant for the treatment of — G. Förster, Saarbrücken. Ger. Pats. (A) 306,601, 22.10.15, and (B) 309,612, 8.8.16.

(A) In a plant in which the sludge is transferred from the settling chamber to an independent treatment chamber divided into compartments, the fresh sludge is introduced into the bottom of a compartment or compartments in which the sludge has attained its most active condition, and the mixed sludge is withdrawn from the top of the compartment or compartments and led into the remaining compartments. (B) In order to reduce the number and length of the connecting pipes required, mixing of the active sludge with fresh sludge is always effected in the same compartment, and the pipes through which the treated sludge is discharged from the compartments on to the drying beds are utilised also for the introduction of fresh or mixed sludge or sewage into the treatment chambers.

Waste products; Manufacture of useful substances from organic — G. Wolff, Paris. Eng. Pat. 121,576, 21.3.18. (Appl. 5021/18.) Int. Conv., 21.12.17.

SLAUGHTER-HOUSE refuse is treated with alkali to produce ammonia, soap and alkali salts of organic acids of high molecular weight having detergent properties being obtained as by-products. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 2790 of 1873, 3493 of 1884, 15,887 of 1886, 8582 of 1900, 17,965 of 1904, and 5620 of 1909; this J., 1885, 232; 1887, 553; 1900, 753; 1905, 626; 1910, 889.)

—J. H. J.

Feed water; Treatment of — in systems for condensing steam and heating feed water in steamships. G. & J. Weir, Ltd., and W. Weir, Glasgow. Eng. Pats. 125,149 and 125,150, 17.6.16. (Appls. 8560 and 8561/16.)

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Nicotine; Detection of — O. Tunmann. Apoth.-Zeit., 1918, 33, 485–486. Chem. Zentr., 1919, 90, II., 227.

A FEW crystals of *p*-dimethylaminobenzaldehyde are dissolved in a drop of strong hydrochloric acid on a microscope slide and a drop of a solution of the alkaloid in water is placed by its side. Immediately the drops touch one another, a rose-coloured band appears at the place of contact; this changes to reddish-violet, and finally the whole liquid assumes the same shade. The colour gradually becomes deeper, and persists for 10–24 hours. Coniine, pyridine, and acetone give no coloration on similar treatment, and pyridine, coniine, and other alkaloids, if present, do not affect the colour due to nicotine. Aniline, in not too dilute solution, gives a red coloration, but the colouring matter separates out immediately in long red spear-shaped crystals. With 0.2 mgrm. of nicotine, the reaction commences in less than a minute, and it is possible by this means to detect the presence of nicotine in cigar smoke. A saturated solution of picric acid

with 10% of hydrochloric acid also gives a very sensitive microchemical reaction with nicotine. With 0.01 mgrm. of nicotine, a yellow, amorphous precipitate separates immediately and rapidly splits up into crystals. With 0.005 mgrm., the precipitate does not appear, but the crystals are formed; these are usually visible to the naked eye, and can always be distinguished by means of a lens. The reaction can be detected with as little as 0.003 mgrm. of nicotine, in which case the crystals take from 2 to 3 minutes to appear. The crystals are coloured yellow and green under crossed nicols, and have an oblique extinction. Aniline, coniine, and dilute pyridine give no crystals, but pure pyridine gives similar crystals, with, however, no amorphous precipitate.—L. A. C.

Alkaloids; Precipitation of — by liquorice. J. W. Plenderleith. Pharm. J., 1919, 102, 236.

THE addition of infusion of liquorice to 1% solutions of strychnine hydrochloride, quinine hydrochloride (neutral), morphine hydrochloride, cocaine hydrochloride, heroine hydrochloride, atropine sulphate, and codeine sulphate caused the immediate formation of heavy yellow precipitates in the case of the first two alkaloids and no immediate precipitation or only a faint haze in the other instances. The B.P. solution of morphine hydrochloride gave a precipitate due to hydrochloric acid, and diluted tincture of opium and meconic acid solution also yielded dense precipitates. Solutions of caffeine alkaloid gave no precipitate whilst slight precipitates were formed with tinctures of digitalis and strophanthus. The precipitate probably consists of the glycyrrhizinate of the alkaloid. Liquorice is not a suitable agent for masking the bitterness of strychnine or quinine.—H. W.

Hydrastinine and its homologues; New synthesis of — K. W. Rosenmund. Ber. d. pharm. Ges., 1919, 29, 200–206.

THE technical preparation of hydrastinine suffers under the disadvantage that the initial material, homopiperonylamine, is difficult to prepare; the author describes the synthesis of certain homologues of hydrastinine from the more readily accessible methylenedioxyphenylisopropylamine and also a new method of converting homopiperonylamine into hydrastinine. Methylenedioxyphenylisopropylamine is condensed with chloromethylalcohol to methylenedioxyphenylisopropylaminomethanol,

$\text{CH}_3\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{NH}_2\text{CH}_2\text{OH}$, which, when treated with aqueous hydrochloric acid, yields 3-methyldehydronorhydrastinine, colourless leaflets, m.pt. 57°–58° C.; methylation of the latter with formaldehyde gives 3-methyldehydronorhydrastinine, m.pt. 85°–87° C., which is oxidised by potassium bichromate and sulphuric acid or by iodine to 3-methylhydrastinine, m.pt. 107°–108° C. 1-Benzyl-3-methylhydrastinine is obtained as a yellow syrup by the action of phosphoric oxide on phenylacetylmethylenedioxyphenylisopropylamine. Homopiperonylamine reacts with chloromethyl alcohol to yield homopiperonylaminomethanol, $\text{CH}_3\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{NHCH}_2\text{OH}$; the latter, like all members of the class, is unstable but is readily converted by warm 10% aqueous hydrochloric acid into dehydronorhydrastinine, identical with the base described by Decker (Annalen, 1911, 395, 282; see also J. Chem. Soc., June, 1919).—H. W.

Digitalis; Chemical evaluation of — A. Tschirch and F. Wolter. Schweiz. Apoth.-Zeit., 1918, 56, 469–474, 495–498, 512–514. Chem. Zentr., 1919, 90, II., 307–309.

ALL the known chemical methods for the evaluation of digitalis were compared with the so-called physiological method, the minimum toxic dose per gram of

og being taken as the basis for the latter values; but no definite relationship could be traced. This is due to the fact that no chemical method determines the whole of the physiologically active substances such as digitoxin, digitalin, gitalin, etc., present in digitalis leaves, and these substances are not present in different leaves in the same proportions. It was eventually found that acetone extracted the whole of the active principles of digitalis, and by its means a chemical determination of these was possible. The leaves were first extracted with ether to remove chlorophyll, fat, etc., and then percolated with absolute alcohol. After purification of the extract with lead, the glucosides were removed from the clear filtrate by shaking with acetone, and separating the acetone layer by addition of sodium chloride. The active substance thus isolated was termed pandigiton, and the physiological value per gram weight of frog was about 2 mgrm. Even with this method agreement was not found between chemical and physiological values, and the conclusion was drawn that substances are present, in themselves inactive, which are nevertheless capable of influencing the activity of the drug. The colour reactions of digitalis are reactions characteristic of the pure glucosides, but these cannot be separated by simple extraction with different solvents.—G. F. M.

Glucosides of digitalis leaves; Adsorption of the — C. Mannich. Ber. deuts. pharm. Ges., 1919, 29, 206—213.

EXPERIMENTS with gitalin showed the latter to be readily adsorbed from aqueous solution by blood charcoal (the latter can adsorb at least 20% of its weight), less readily from alcoholic solution, and still less readily from solution in chloroform. A specimen of charcoal containing 20% of gitalin did not lose glucosides when treated with water and only a portion when alcohol was used, but practically all of the gitalin was removed by chloroform. Other substances, such as fullers' earth, the sulphides of lead, copper, and zinc and particularly those of arsenic and antimony, have the power of adsorbing the bitter principles from an aqueous extract of digitalis leaves. Attempts to isolate the glucosides by treatment of infusion of digitalis with animal charcoal and subsequent extraction of the latter with chloroform did not lead to the desired result, possibly because the principles are not free in the aqueous solution but in complex compounds with other substances such as tannins. The author considers that the readiness with which the digitalis glucosides are adsorbed by the powdered drug explains the difficulty of their complete extraction and also the better results which are obtained when water, as solvent, is replaced by alcohol.—H. W.

Strophanthus and digitalis tinctures of different origin; Pharmacological evaluation of — G. Joachimoglu. Ber. deuts. pharm. Ges., 1919, 29, 170—199.

The value and permanence of the tinctures is determined by observing the lethal dose for the male frog according to Heffter's method (Berl. klin. Wochenschr., 1916, 54, 669). The strophanthus tinctures were prepared from ordinary and fat-free seeds of the three strophanthus varieties. That derived from *Strophanthus Kombé* proved to be the most active. The tincture obtained from fat-free *S. Kombé* seeds was only about half as active as the ordinary tincture, but no such difference was observed with the tinctures of *S. gratus*. After two years, a small decrease in activity was observed with tinctures from the ordinary seeds, whilst those made from fat-free seeds remained practically unaffected. Digitalis tinctures prepared with absolute or with 68–69% alcohol (according to the Deutscher

Arzneibuch 5) proved equally active. In the preparation of these tinctures only 75% of the digitalis substances which can be removed by extraction in a Soxhlet apparatus are obtained. After four months both tinctures retained their activity which, however, was lost to some extent after eleven months, possibly owing to a high summer temperature, since direct experiment showed that increase in temperature causes a more rapid diminution in activity. Light appears to have little influence. Examination of a number of commercial samples of digitalis tincture showed them to vary greatly in pharmacological action, some being almost three times as potent as others. This is attributed to a difference in activity of the different specimens of digitalis leaves.—H. W.

Aspirin [acetylsalicylic acid] and aspirin tablets; Purity of commercial — A. J. Jones. Chem. and Drug., 1919, 91, 402—404.

For the detailed examination of samples of aspirin a determination of acid, ester, and bromine values, the free salicylic acid, the melting point, and the odour and colour in soda solution, are suggested. The bromine value is obtained by adding a solution of bromide and bromate to the aspirin solution, acidifying, and determining the residual bromine by addition of iodide and titration with thiosulphate, whilst for the estimation of free salicylic acid the following procedure is recommended: 0.6 grm. of aspirin is dissolved in 9 c.c. of alcohol and diluted with water to 90 c.c., of which solution portions of 60 c.c. and 30 c.c., with 3 c.c. of alcohol, are placed in two similar Nessler glasses, and the smaller volume is adjusted to equal the larger so that there is a difference of 0.2 grm. of aspirin in mixtures containing the same quantities of alcohol and water. 1 c.c. of 1% iron alum is then added to each solution and the colours matched by adding the requisite quantity of 0.01% salicylic acid. When the test is carried out by the method described in the British Pharmacopœia, crystalline condition and surface effects will often conceal free salicylic acid, as will also the depressing effect of alcohol on the coloration when the test is performed in dilute alcoholic solution. In soda solution yellow to pale straw colours were observed with commercial aspirin, and in certain cases objectionable odours were developed. The author suggests as a standard that the acid and ester values should not differ by more than 0.3 c.c. of N/5 soda per grm., free salicylic acid should not exceed 0.15%, the melting point should not be lower than the present official standard, and only a pale straw colour and no odour should be developed in soda solution. With aspirin tablets a determination of the free salicylic acid by iron, and the total by bromine, is the most satisfactory method of investigation.

—G. F. M.

Sodium salicylate. J. W. Plenderleith. Pharm. J., 1919, 102, 236.

It is known that solutions of sodium salicylate, 1 in 1, are liable to deposit crystals of the salt containing 6 mols. H_2O . Under certain conditions or with some samples of sodium salicylate crystals may be deposited from a 1 in 2 or even a 1 in 3 aqueous solution.—H. W.

Eugenol, triacetin, and benzyl alcohol; Analysis of a mixture containing — H. Perperot. Ann. Chim. Analyt., 1919, [11], 4, 112—114.

The amount of triacetin present is calculated from the saponification value of the mixture. To determine the eugenol, the iodine value of the mixture is determined by Hübl's method; exactly 0.5 grm. of the sample is taken for the determination and the time of contact with the Hübl reagent should be

2 hrs.; the number of c.c. of thiosulphate solution (24 grms. per litre) corresponding with the iodine absorbed is multiplied by 1.64 to obtain the percentage of eugenol. Another portion of the sample is boiled for 2 hrs. with sodium acetate and an excess of acetic anhydride, and the saponification value of the acetylated product is determined. After deducting the saponification values due to the triacetin and acetylated eugenol, the remainder is a measure of the benzyl alcohol.—W. P. S.

Thymol; Estimation of —. E. Moles and M. Marquina. *Anal. Fis. Quím.*, 1919, 17, 59—83.

A solution of thymol in water is added to sodium bicarbonate solution. A measured quantity of standard iodine is added in excess. After addition of sulphuric, or preferably, hydrochloric acid, the excess of iodine is titrated with thiosulphate solution. With varying values of the ratios thymol: bicarbonate and thymol: iodine added, the mean quantity of iodine consumed per molecule of thymol was found to be 3.60 atoms.—W. S. M.

Dichloroethyl sulphide [mustard gas]. III. Solubility and hydrolysis of dichloroethyl sulphide, with a new method for estimating small amounts of the same. E. F. Hopkins. *J. Pharmacol.*, 1919, 12, 393—403.

THE solubility of dichloroethyl sulphide in water has been determined and, at 10° C., has been found to be approximately 0.07%. The velocity of hydrolysis of dichloroethyl sulphide has been measured at 0.6° C., 10° C., 20° C., 30° C., and 37.5° C.; the data are graphically represented in a series of curves. Hydrolysis is found to follow the equation for a unimolecular reaction. Dichloroethyl sulphide in admixture with air may be rapidly estimated by bubbling the gas through a series of two tubes containing water at 35° C.; the gas is rapidly absorbed and hydrolysed and the hydrogen ion concentration of the solution is then measured, methyl red being used as indicator. It is necessary that all the glass ware used should be unaffected by water.—H. W.

Cacodyl compounds; Estimation of arsenic in volatile —. L. C. Maillard. *Bull. Soc. Chim.*, 1919, 28, 192—200.

A SUITABLE weight of the cacodyl compound, in a sealed bulb if liquid or in a narrow tube if solid, is introduced into a 150 c.c. flask containing 3 grms. of ammonium persulphate, 30 c.c. of water, and 10 c.c. of sulphuric acid. The flask is quickly closed with a ground-in stopper and thoroughly shaken, until the air in the flask, which becomes cloudy at first, is quite clear. The arsenic is now in the form of cacodylic acid and is subsequently oxidised to arsenic acid by means of nitric acid and precipitated as magnesium ammonium arsenate, either with or without an intermediate precipitation as arsenic sulphide. The method was applied to cacodyl chloride and found to be quite accurate and preferable to the usual dry oxidation method.—W. G.

Methyl alcohol and absolute alcohol; Simple method of distinguishing between —. T. Sabalitschka. *Ber. deuts. pharm. Ges.*, 1919, 29, 214—219.

THE sample (2 c.c.) is frequently shaken during ten minutes with powdered crystalline copper sulphate (0.1 gm.) and the solution is filtered. The filtrate is treated with water (5 c.c.) and ammonia solution (10%, 3 c.c.); with methyl alcohol, a deep blue to blue coloration is developed whilst with ethyl alcohol the solution is only coloured a faint, pale blue. The method may also be used to obtain an approximate estimation of methyl alcohol in mixtures of the latter with absolute alcohol providing

the content is not less than 20%; if this is the case, 20 c.c. of the specimen is distilled and the test is performed on the first 2 c.c. of the distillate (compare Fendler and Mannich, this J., 1905, 1128), but the results are only reliable when affirmative. In the presence of water, even in small quantities, the process is useless since the solutions of hydrated salts in alcohol are unstable and the presence of water promotes separation of the salt. Instead of copper sulphate crystalline ferrous sulphate may be used. The test is performed in a similar manner but, owing to the greater instability of the solutions, agitation should be restricted to five minutes. The presence of iron in the filtrate is detected by addition of water (5 c.c.) and 2.5% potassium ferricyanide solution (2 c.c.), the colorations obtained varying from dark blue with pure methyl alcohol to pale green with ethyl alcohol.—H. W.

PATENTS.

Acetaldehyde; Manufacture of —. J. Crosfield and Sons, Ltd., Warrington, and T. P. Hidditch, Grappenhall. *Eng. Pat.* 124,702, 25.4.18. (*Appl.* 3541/19.)

THE sludge of mercurous sulphate and mercury formed during the conversion of acetylene into acetaldehyde by passing the gas into a solution of mercuric sulphate and sulphuric acid at 60° C., is oxidised and its activity restored by the addition of a small quantity of manganic acid, permanganic acid, or a salt of one of these acids. The reinvigoration of the sludge can be effected repeatedly until the accumulation of aldehyde by-products and resins renders it necessary to wash the sludge free from organic matter before re-oxidation in the presence of fresh sulphuric acid. It is advisable to maintain the concentration of the mercuric salt in the solution at from 0.5—1.5% expressed as mercuric oxide and to prevent any possibility of contact of the solution with metallic fittings. By passing acetylene through a solution of 40 parts of sulphuric acid (sp. gr. 1.84), 5 parts of crystallised ferric sulphate, and 2 parts of mercuric oxide in 153 parts (by weight) of water at 60° C., approximately 41 parts by weight of acetaldehyde can be produced in two hours, after which the reaction becomes sluggish but can be restored by the addition of one part of potassium permanganate, when 25 parts of acetaldehyde may be obtained in the next 2 hours. The quantity of permanganate used was 3.8% of the acetaldehyde produced and this was 96.9% of the theoretical quantity demanded by the observed absorption of acetylene.—D. F. T.

Tetranitromethane; Manufacture of —. K. J. P. Orton, Bangor. *Eng. Pat.* 125,000, 3.8.18. (*Appl.* 12,714/18.)

ACETYLENE is passed into 90—97.5% nitric acid, preferably at a temperature of about 40° C.; absorption occurs more readily in the presence of mercury or a mercury salt, for instance mercuric nitrate added to the extent of 0.2—0.6% of the weight of the nitric acid, and the yield is increased at 30°—40° C., though not at the ordinary temperature. The product is mixed with sulphuric or fuming sulphuric acid under conditions excluding rise of temperature (the proportion of acid should be about twice the weight of the nitric acid used since, with small proportions, explosion is liable to occur) and the mixture is gently heated till the tetranitromethane distils or, preferably, gently heated under a reflux condenser until gas ceases to be evolved and then distilled. Apparently the chief product of the action of acetylene on nitric acid is an intermediate compound which is converted into tetranitromethane when the solution is heated with sulphuric acid.—H. W.

[Sodium salicylate.] Apparatus for treating chemicals [in manufacture of —]. J. D. Sartakoff, New York. U.S. Pat. 1,284,468, 12.11.18. Appl., 5.6.17.

AN apparatus for the manufacture of sodium salicylate by the action of carbon dioxide on sodium phenoxide according to the Bayer process, consists of a number of drums heated in an oil bath, a cooling device through which the oil can be circulated in order rapidly to reduce its temperature, and a thermostatic device by means of which the oil can be kept at the desired temperature at each stage of the treatment with carbon dioxide.

Benzoylation of organic amido compounds; Process for the —. F. Reverdin, Geneva, Switzerland, Assignor to Newport Chemical Works, Inc., Milwaukee, Wis. U.S. Pat. 1,296,602, 4.3.19. Appl., 16.7.18.

BENZOYLATION is effected at a moderate temperature, without the use of a solvent, by the action of benzoyl chloride in presence of a small amount of concentrated sulphuric acid. (See also this J., 1918, 715 A.)

Hydantoins; Preparation of —. Chem. Fabr. von Heyden A.-G., Radebeul. Ger. Pats. (A) 309,508, 5.5.14, and (B) 310,426, 13.5.14.

(A) ARYL-ALKYL-HYDANTOINS are obtained by the action of hypochlorite or hypobromite solutions on CC-aryl-alkylcyanacetamides. Thus phenylethylcyanacetamide (m.pt. 116° C.) obtained from ethyl iodide and sodium phenylethylcyanacetamide dissolves in sodium hypobromite solution, and, on warming, gives phenylethylhydantoin which forms glistening needles, m.pt. 201°–202° C. Phenylallylhydantoin is obtained in an analogous manner. The arylalkylhydantoins are useful as soporifics. (B) Hydantoins are obtained by the action of hypochlorites or hypobromites on disubstituted malonamides. Thus diethylmalonamide and potassium hypobromite give diethylhydantoin, phenylethylmalonamide (m.pt. 124° C. with decomp.) prepared from phenylethylcyanacetamide and concentrated sulphuric acid at 125° C., gives, after standing for several hours with sodium hypobromite, phenylethylhydantoin, whilst in an analogous manner sodium hypochlorite converts diallylmalonamide into CC-diallylhydantoin. The first action of hypochlorite is the formation of monochloramides which may be isolated by acidifying immediately after the amide has dissolved.

—G. F. M.

Hypophysis gland; Extractive product from the —. Salts of the extractive product from the hypophysis gland. F. Flaecher and B. Reuter, Assignors to Farb- u. vorm. Meister, Lucius, u. Brüning, Höchst, Germany. U.S. Pats. (A) 1,296,063 and (B) 1,296,064, 4.3.19. Appl., (A) 25.9 and (B) 23.12.12. (n) Renewed 19.11.15.

See Eng. Pat. 23,655 of 1912; this J., 1913, 450.

Treating peat. Eng. Pat. 124,629. See XVI.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

PATENTS.

Radio-photography; Negative plate substitutes for —. E. M. Burnett, Hayes Town, Middlesex. Eng. Pat. 125,490, 18.9.18. (Appl. 5810/18.)

A NEGATIVE plate substitute for use in radio-photography is prepared by coating paper with calcium tungstate emulsified in gelatin or other suitable medium, and then with a sensitive photographic emulsion.—L. A. C.

Photochemical etching process. J. Rieder, Berlin-Steglitz. Ger. Pat. 309,376, 18.1.18.

THE surface to be etched is covered with a sensitised film of caoutchouc and asphalt, exposed below a negative, developed with acetone or a similar substance, dusted over either at once, or after a light etching, with a powdered low-melting resin, and gently warmed until the powder melts. The surface may then be deeply etched by the usual means; the resin is firmly held on the exposed and developed portions and protects these from corrosion.

—G. F. M.

Platinum toning of printing out paper. B. Ehrenberg, Elbing. Ger. Pat. 310,445, 17.12.16.

A DEEP print is made, and is bleached in a 15% salt solution, preferably after washing out the chloride. It is then placed in a preliminary bath of ammonia, or an alkaline ammonium salt, toned in a gold bath, and finally fixed in a concentrated sodium thiosulphate bath (at least 15%) until the blue and red tone of the gold is destroyed. A pure platinum tone of great brilliance even with thin negatives, is thus obtained without the use of platinum. The best results are attained by using a buff coloured paper ("chamoiscelloidin papier") as otherwise the ground colour of the paper interferes somewhat with the purity of the platinum tone.—G. F. M.

XXII.—EXPLOSIVES; MATCHES.

Sulphuric and nitric acids; Densities of mixtures of —. P. Pascal and Garnier. Bull. Soc. Chim., 1919, 25, 142–145.

TABLES are given showing the densities of sulphuric and nitric acids at varying concentrations, and of mixtures of these acids in different proportions and with varying proportions of water added. The results indicate that, in the zone of mixtures used for nitrating cotton, the density is almost entirely a function of the water content.—W. G.

Mercury fulminate; Analysis of —. A. Langhans. Z. anal. Chem., 1918, 57, 401–445.

THE method proposed depends on the volumetric determination of the hydroxylamine formed when mercury fulminate is dissolved in hydrochloric acid. Three grms. of the sample is dissolved in 12 to 15% cold hydrochloric acid and the solution is diluted with the acid to 100 c.c., 5 c.c. of this solution is mixed with 50 c.c. of iron alum solution (iron alum, 5 grms., 30% sulphuric acid, 25 c.c., water to 100 c.c.), the mixture is boiled for 18 mins., then diluted with a mixture of dilute sulphuric acid (1:4), 30. and water, 50 c.c., and titrated at 60° C. with N/20 potassium permanganate solution. With the above quantities of sample, reagents, etc., 84.48 c.c. of permanganate solution is equivalent to 100% of mercury fulminate. Attempts to determine the formic acid produced at the same time as the hydroxylamine were unsuccessful. (See also this J., 1918, 637 A.)—W. P. S.

Ammonium nitrate. Bolling. See VII.

PATENTS.

Picric acid; Manufacture of —. A. G. Green, Leeds. Eng. Pat. 16,607, 24.11.15.

BENZENE is converted successively into chlorobenzene, dinitrochlorobenzene, and dinitrophenol, and the latter is nitrated to picric acid by treatment with one molecular proportion (or slightly more)

of nitric acid in the presence of concentrated sulphuric acid. When the reaction is complete, the mixture is cooled to about 40° C., run into cold water contained in a wooden vat, and the liquor run on to a suction filter. Alternatively, water may be added to the mixture after nitration, the picric acid allowed to crystallise by cooling, and the waste acid filtered off through a filter-bed composed of tiles or other acid-resistant material. An almost theoretical yield is obtained, the operations can be conducted in large charges in cast-iron nitrating vessels, the evolution of nitrous fumes is very small, and the waste sulphuric acid can be readily reconcentrated as it contains no by-products. In nitrating the dinitrophenol the nitric acid may be replaced by an equivalent amount of dry sodium nitrate, but in this case the recovery of the sulphuric acid presents difficulties.—T. St.

Picric acid; Process of manufacturing — and apparatus employed therewith. D. B. Macdonald, Leicester. Eng. Pats. 17,525, 15.12.15, and 5551, 15.4.16.

Picric acid, prepared either from benzol by the action of mercury and nitric acid, or by the nitration of sulphonated phenol by means of alkali nitrates, is dissolved in benzol, and the solution separated from the other products of the reaction. A suitable portion of the benzol is driven off and the residue allowed to crystallise, after which the mother liquor is run off, and the remaining benzol driven off by heat. Detailed working directions are given with reference to apparatus in which the various operations are conveniently and economically carried out.—T. St.

Picric acid; Manufacture of — from dinitrophenol in crystal form and the elimination therefrom of the sulphate of lead. L. B. Holliday and L. G. Badler, Huddersfield. Eng. Pat. 124,490, 31.1.16. (Appl. 1442/16.)

AFTER the last addition of mixed acid in nitrating dinitrophenol, the mass is heated to about 85° C., and hot water at about 85° C., or steam, is added in sufficient quantity to raise the temperature to 122° C. or over. The mass is then agitated, cooled to 25°–30° C., and filtered, and the picric acid crystals washed with weak sulphuric acid free from lead sulphate. Any lead sulphate contained in the strong sulphuric acid used in nitrating is by this means almost entirely left in solution when the picric acid crystallises, and the subsequent washing removes any lead sulphate retained by the crystals.—T. St.

Nitration process and apparatus therefor. Chance and Hunt, Ltd., and A. E. Holley, Oldbury, and O. E. Mott, Woolwich. Eng. Pat. 124,461, 7.1.16. (Appl. 317/16.)

APPARATUS designed more particularly for the production of trinitrotoluene consists of eight or more jacketed pots in series through which the organic matter being nitrated and the acid pass in opposite directions. Each pot is divided by a vertical partition into mixing and separation compartments which are in direct communication through a hole provided at about the centre of the partition. Alternatively, communicating but independent mixing and separator pots may be used. Except in the case of the end members of the series, the bottom of each separator is connected to the bottom of the adjacent mixing pot on one side, and the top of the separator to the top of the adjacent mixing pot on the other side. The pots may all be at the same level, the flow of acid and nitrated substance being caused solely by the head produced in the separators. Sulphuric acid (92–94%) is fed

into the pot from which the finished product is taken and nitric acid is introduced as required into the intermediate pots.—T. St.

Trinitrotoluene; Purification of —. The Clayton Aniline Co., Ltd., A. Schedler, and E. N. Marchant, Manchester. Eng. Pat. 124,803, 8.4.16. (Appl. 5178/16.)

TRINITROTOLUENE still containing excess of sulphuric acid from the nitration process is heated with water and a suitable quantity of sodium hypochlorite solution at 80°–85° C. for 20 to 30 minutes. After settling, the trinitrotoluene is run off, washed until neutral, and dried.—T. St.

Guncotton; Means for nitrating —. G. Fussell, Lockport, N.Y. U.S. Pat. 1,296,280, 4.3.19. Appl., 1.3.17.

A VERTICAL hollow screw is mounted in a perforated cylindrical basket which, in turn, is mounted within a casing provided at its bottom with an annular acid-receiving gutter, and means are provided for rotating the screw and the basket at different speeds. One edge of the hollow screw, below the thread, is cut away to form an opening for the passage of cotton, the lower edge of the screw thread engaging the bottom of the basket. Means are provided for feeding saturated cotton to the interior of the screw, and means within the casing and below the top of the basket for receiving and conveying the guncotton from the top of the screw.—T. St.

Explosive. A. J. Marin, Stockholm, Sweden. U.S. Pat. 1,297,213, 11.3.19. Appl., 29.5.18.

A COMPRESSED solid safety explosive, capable of being detonated freely in the open air by a No. 6 detonator, is prepared by mixing in a damp state 28–34% of a nitronaphthalene with 72–66% of an oxidising mixture composed of ammonium perchlorate 47, and sodium nitrate 34 parts by weight, and compressing the mixture so that the specific gravity shall be between 1.3 and 1.62 after drying. T. St.

Mixing explosive compounds; Plant for — and for simultaneously charging a plurality of shells or the like. J. L. Musgrave and R. G. Crittall, London. Eng. Pat. 125,477, 24.8.16. (Appl. 12,023/16.)

Nitration process. A. E. Holley, Oldbury, and O. E. Mott, Woolwich, Assignors to Chance and Hunt, Ltd., Oldbury. U.S. Pat. 1,297,170, 11.3.19. Appl., 5.12.17.

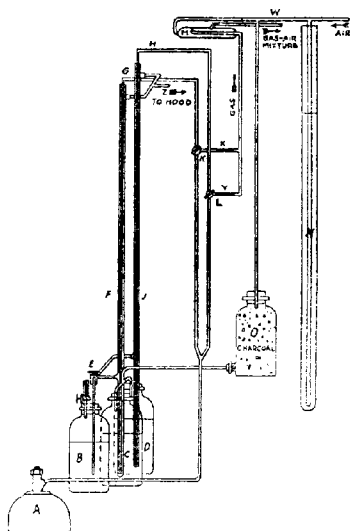
SEE Eng. Pat. 124,461 of 1916; preceding.

XXIII.—ANALYSIS.

Meter; Automatic compensating flow —. G. G. Oberfell and R. P. Mase. J. Ind. Eng. Chem., 1919, 11, 294–296.

IN the apparatus described, a varying pressure is maintained on the inlet of a capillary tube such that the pressure difference between the inlet and outlet is always constant; it is an advantage to use two such devices, since the concentration of the gas in a gas-air mixture can be changed from one concentration to another almost instantly, and the apparatus can also be used in maintaining the con-

centration of binary gas-air mixtures. Referring to the diagram, *C* and *D* are levelling bottles of about 3 qts. capacity; the height of the liquid in these bottles determines the constant pressure difference on the inlet and outlet of the capillaries. *B* is a supply reservoir for *C* and *D*. *F* and *J* are glass tubes of about $\frac{3}{8}$ in. diameter; *G* and *H* are small glass tubes through which the excess of gas escapes and these tubes reach nearly to the bottom of *C* and *D*. *X* and *Y* are the capillaries which admit the gas into the gas-air mixture line at the mixing chamber, *M*. The three-way capillary taps,



K and *L*, direct the flow of gas through the capillaries and overflow tubes, *G* and *H*. The line, *W*, is connected with the gas-air mixture line just ahead of the gas inlet by a T-tube; it passes through a bottle, *O*, filled with charcoal (to absorb gas which might escape from the liquid in *C* and *D*) and thence into the levelling bottles, *C* and *D*. When the apparatus is in use, the pressure in the gas-air line is communicated to the bottles, *C* and *D*, and forces the liquid up into the tubes, *F* and *J*, until the difference in level counterbalances the pressure in the gas-air line. This line pressure is that which is against the outlets, *X* and *Y*, at all times, consequently, the height of the liquid in *F* and *J* above the levels of the liquid in *C* and *D* affords a measure of the pressure against the outlets of the capillaries. The gas flowing slowly from the cylinder, *A*, is conducted through a T-tube to the taps, *K* and *L*; one of these is closed to the capillary not in use whilst the other is so turned that the gas flow divides, part of it passing through the capillary and the remainder through the overflow tube. The overflow gas bubbles out against the height of liquid in *F* or *J* above the level in *C* or *D*; hence the pressure difference on the inlet and outlet of the capillary in use is always constant and equal to the pressure afforded by the height of the liquid in *C* or *D*. The proper size for the capillaries must be determined experimentally.

—W. P. S.

Electrical precipitator for analysing smokes. R. C. Tolman, L. H. Reyerson, A. P. Brooks, and H. D. Smyth. *J. Amer. Chem. Soc.*, 1919, 41, 587—589.

A modified Cottrell precipitator for removing the solid particles from smoke is described. It consists of a glass tube, $\frac{1}{8}$ in. diam. and 10 in. long,

inside which is a thin aluminium foil cylinder, 0.001 in. thick, which constitutes the anode. A cathode of No. 25 platinum wire threaded with a jeweller's die passes centrally down the aluminium cylinder. Entrance and exit tubes for the smoke are attached at the ends. The electrodes are connected to a source of high voltage current (15,000 volts) and a corona discharge is produced; sparking must be avoided. The smoke is admitted at the rate of 5 litres per minute, the negatively charged particles being deposited on the aluminium foil. The weight of the particles is determined by weighing the anode before and after the precipitation.—J. F. S.

Anions; Indirect electrolytic estimation of — without platinum electrodes. E. Lassala. *Anal. Fis. Quim.*, 1919, 17, 88—95.

Chloride, bromide, and iodide ions are precipitated by means of silver nitrate, the silver halide is dissolved in 20% solution of potassium cyanide, caustic soda is added, and the solution is electrolysed with a nickel-plated copper cathode and a rotating iron anode. Towards the end of the electrolysis the electrolyte is heated nearly to boiling. The results are excellent.—W. S. M.

Carbon dioxide in gases; Rapid determination of —. W. A. Hargreaves. *Chem. Eng. and Min. Rev.*, Australia, 1919, 11, 142—143.

A sample of gas to be examined is drawn into a 100 c.c. calibrated burette by means of a close-fitting plunger, and is adjusted to atmospheric pressure by opening the tap momentarily. The burette is fixed over, and connected by means of a capillary tube to a stoppered bottle filled with a solution of sodium hydroxide. The gas is forced out of the burette into the bottle, and some of the reagent is thereby caused to pass into a second bottle, and after absorption of carbon dioxide is completed, the plunger is raised carefully until the solution is drawn back to a predetermined mark on the capillary tube. The percentage by volume of carbon dioxide is represented by the difference in position of the plunger base. Technically accurate results are given by this apparatus, the average error in a number of analyses being 0.3% on the volume of gas taken.

—C. A. K.

Phosphoric acid; Gravimetric determination of —. L. W. Winkler. *Z. angew. Chem.*, 1919, 32, 99—101.

A CRITICAL examination of the determination of phosphoric acid by precipitation as ammonium magnesium phosphate. The phosphate solution, measuring 100 c.c. and containing about 0.1 gm. of P_2O_5 , is treated with 2.5 grms. of ammonium chloride, boiled, 10 c.c. of 10% ammonia is added, followed by 0.5 c.c. of magnesium sulphate solution (magnesium sulphate, 10, ammonium chloride, 5 grms., water, to 100 c.c.). The hot mixture is stirred until the precipitate becomes crystalline, a further 9.5 c.c. of the magnesium sulphate solution is added slowly, and when the mixture is quite cold, the precipitate is collected, washed with 1% of ammonia, dried, and weighed. The precipitate may be converted into magnesium pyrophosphate by ignition before being weighed. With quantities of magnesium pyrophosphate varying from 0.05 to 0.25 gm., the weight found is about 0.3 mgrm. too high. Potassium and sodium chlorides do not interfere when the precipitate is weighed as ammonium magnesium phosphate, but the presence of potassium chloride causes the result to be too high if the precipitate is ignited to pyrophosphate before being weighed. The figures obtained are

slightly too high when the phosphoric acid has been precipitated previously as ammonium phosphomolybdate in order to separate it from iron, calcium, etc.—W. P. S.

Phosphoric acid; Gravimetric determination of — as magnesium pyrophosphate. Z. Karaoglanow. Z. anal. Chem., 1918, 57, 497—541.

INVESTIGATION of the various methods for the precipitation of ammonium magnesium phosphate showed that the results obtained are to some extent dependent on the temperature of precipitation, method of precipitation (slow or rapid), and proportion of magnesium chloride, ammonium chloride, etc., present. In most cases, however, the differences are very small. The presence of potassium chloride in the solution causes the results to be too high owing to the inclusion of potassium in the precipitate. (See also J. Chem. Soc., June, 1919.)—W. P. S.

Methoxyl group; Estimation of the —. J. T. Hewitt and W. J. Jones. Chem. Soc. Trans., 1919, 115, 193—198.

ZEISEL'S method is modified by the use of a rectifying column in place of the inclined condenser (compare Hewitt and Moore, this J., 1902, 195) and by collecting the methyl iodide vapour in pyridine (compare Kirpal and Bühn, this J., 1914, 570); the resulting mixture of pyridine and its methiodide is then diluted with water, acidified with nitric acid, and treated with a known amount of silver nitrate; the excess of the last reagent may then be determined by Volhard's method with thiocyanate. For the preparation of the hydriodic acid it is recommended to saturate an aqueous suspension of iodine with hydrogen sulphide, whilst the pyridine is obtained from commercial pyridine bases by distilling with two-thirds their weight of water and collecting the fraction between 93° and 97° C.; this is then shaken with one-third its weight of solid sodium hydroxide, and the fraction boiling between 114° and 117° C., obtained on distillation of the upper layer, is collected for use. The method may be applied to the examination of the products of wood distillation or other mixtures containing methyl alcohol as follows: A suitable amount (*a*, *infra*) of the liquid is heated with 20 c.c. of hydriodic acid (sp. gr. 1.7) for one hour and the mixture diluted with water to 100 c.c.; to an aliquot portion (*b*, *infra*) are added to 70 c.c. of water, 25 c.c. of *N*/10 silver nitrate, and 30 c.c. of 10*N* nitric acid, the liquid is shaken for 5 mins., and 5 c.c. of concentrated ferric alum indicator is added. *N*/10 Thiocyanate solution is now added until further addition of one drop produces a permanent orange colour. Suitable amounts to be used are: (i) Pyroligneous acid, *a*, 5 c.c.; *b*, 40 c.c.; (ii) Crude wood naphtha, *a*, 5 c.c. of 10% aqueous solution; *b*, 40 c.c. (iii) Methyl alcohol and mixtures of methyl alcohol with acetone, *a*, 5 c.c. of 10% solution; *b*, 20 c.c. The weight of methyl alcohol in 100 c.c. of the liquor is found by deducting from 25 the volume of thiocyanate used and multiplying by (i) 0.16, (ii) 1.6, or (iii) 3.2. The method gave results averaging 1% low when tested on artificial mixtures containing methyl alcohol and other products of wood distillation. The authors consider that when precautions are taken to eliminate, prior to analysis, substances other than methyl alcohol, yielding methyl iodide, the errors due to losses outweigh the error introduced through ignoring their presence.—D. F. T.

Nessler solution; Regeneration of —. D. Pullman. Analyst, 1919, 44, 124—125.

A MODIFIED Nessler solution in which a double iodide of zinc and mercury replaces the potassium mercury iodide gives as good results as the ordi-

nary reagent. It is prepared by heating a suspension of 431 grms. of mercuric iodide in 500 c.c. of water to boiling point on the water-bath, adding 31 grms. of zinc, and heating the mixture, with stirring, for 5 mins., after which the hot solution of zinc mercuric iodide is filtered, the precipitated mercury washed with boiling water, and the filtrate and washings made up to 3000 c.c. with warm water. After cooling, a saturated solution of mercuric chloride is added, a few c.c. at a time, until a permanent red precipitate appears. A solution of 540 grms. of sodium hydroxide in 1000 c.c. of water is added, and the whole made up to 5000 c.c. In practice the best results are obtained by adding 3 c.c. of the reagent to 50 c.c. of the water to be tested. Should the finished solution throw down a red precipitate the smaller effective amount of potassium iodide should be added. The metallic mercury precipitated, as described, is dissolved in 100 c.c. of strong nitric acid and the solution made up to 1000 c.c. In regenerating used Nessler solution prepared by this method the liquid is slightly acidified with sulphuric acid, and for every 5 c.c. of the original reagent present one c.c. of the mercuric nitrate solution is added, and the precipitated mercuric iodide is washed and dried for the preparation of the modified solution.—C. A. M.

Elasticum reaction of wool. Herbig. See V.

Moisture in [wood] pulp. Slack. See V.

Boric acid. Prescher. See VII.

Nitrites. Laird and Simpson. See VII.

Oxygen in iron. Cain and Pettijohn. See X.

Analysis of calcium and "lurgie" metal. König. See X.

Acidity of coconut and palm oils. Vizern and Guillot. See XII.

Tannins. Lauffmann. See XV.

Extractor. Reed and Churchill. See XV.

Grease in leather. Wilson. See XV.

Beet sugar products. Gillet. See XVII.

Aldose sugars. Colin and Liévin. See XVII.

Reducing sugars. Bettinger. See XVII.

Cider etc. in wine. Schützlein. See XVIII.

Methyl alcohol. Salkowski. See XVIII.

Renatured alcohol in spirits. Wolfrum and Pinnow. See XVIII.

Spoiled meat. Falk and McGuire. See XIXa.

Methyl alcohol and denatured alcohol [in milk analysis]. Prescher. See XIXa.

Nicotine. Tunmann. See XX.

Digitalis. Tschirch and Wolter. See XX.

Aspirin. Jones. See XX.

Eugenol, triacetin, and benzyl alcohol. Perperot. See XX.

Thymol. Moles and Marquina. See XX.

Dichloroethyl sulphide. Hopkins. See XX.

Cacodyl compounds. Maillard. See XX.

Methyl and ethyl alcohols. Sabalitschka. See XX.

PATENTS.

Gases; Apparatus for the detection and measurement of —. G. A. Shakespear, Birmingham. Eng. Pat. 124,453, 4.1.16. (Appl. 112/16.)

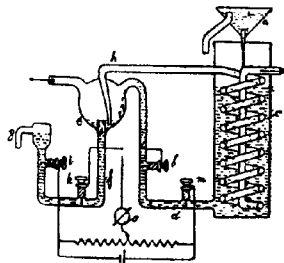
Two similar electrically heated wires are arranged in cavities in a metal block so that one is exposed to the gas to be tested and the other is surrounded by a standard gas such as air. The two wires form part of a Wheatstone bridge system which is thrown out of balance by any difference in the rate of loss of heat of the two wires, and the deflection of a galvanometer or the adjustment necessary to restore a state of balance is employed to give a measure of a known constituent, such as hydrogen, in the gas to be tested.—T. St.

Density of gases; Apparatus for measuring the —. Naturgas, G.m.b.H., Lemberg. Ger. Pat. 309,577, 13.4.16.

A GLASS vessel is provided with inlet and outlet tubes and a connection to a mercury manometer, each tube being fitted with a stopcock. Platinum contacts are sealed into the arms of the manometer, the contact in the arm attached to the vessel being near the bottom, and that in the other arm being about the middle of the height. The contacts are connected to a battery and to an electrically controlled chronometer. The gas under examination is passed into the vessel under a pressure sufficiently high to force the mercury in the manometer below the level of the lower contact and above the level of the other contact. On closing the inlet and opening the outlet tube the gas passes out and the time taken for a definite volume to leave the apparatus is registered by means of the chronometer. From the time recorded, the density of the gas can be readily calculated, the temperature of the gas being registered by means of a thermometer within the vessel.—L. A. C.

Ammonia content of gases and waste liquors; Apparatus for measuring and continuously recording the —. J. H. Reineke, Weitmar. Ger. Pat. 309,733, 15.11.16.

WATER or acid drops at a constant rate from *a* into the vessel, *c*, and passes out through the tube, *d*, into the vessel, *e*. The liquid leaves the bottom



of this vessel by the tube, *f*, and escapes through *g*. The gas containing the ammonia is led through a coil contained in the vessel, *c*, and into the vessel, *e*, by means of the tube, *h*. Into the tubes

d and *f* are sealed electrodes, *i*, *k*, *l*, and *m*, which are connected with a galvanometer *o*, an adjustable resistance, and an alternating current generator as shown in the diagram. The resistance is adjusted so that when no ammonia is passing through, the galvanometer registers zero; when ammonia is bubbled through the alteration in the resistance of the column of liquid between *i* and *k* causes a deflection of the galvanometer, the extent of the deflection depending upon the quantity of ammonia absorbed. An automatic recorder may also be attached to the galvanometer.—L. A. C.

Sulphur dioxide in gases. Ger. Pat. 309,981. See VII.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

Allen and Co., and Coles. Apparatus for mixing, circulating, and agitating materials in liquid or semi-liquid state. 12,588. May 19.
Brayshaw, Brayshaw, and Yates. Furnaces. 12,747. May 21.
Cloudsley. Drying apparatus. 12,602. May 19.
Dressler, and Dressler Tunnel Ovens, Ltd. Tunnel ovens etc. 12,714. May 14.
Hall and Searle. Rotary machines for treating air etc. with liquids etc. 13,050. May 24.
Harris. Drying apparatus. 12,534. May 19.
Harris. Mixing and/or agitating machines. 13,032. May 23.
Haviland and Morris. 12,254. See XI.
Henning. Agents for refrigeration plants, and process of making same. 13,104. May 24.
Lemoine. 12,244 and 12,344. See XVII.
Morison. Condensing plant under vacuum. 12,918. May 22.
Piccard. 12,292. See VII.
Plumbridge. Recovery of volatile solvents. 12,103. May 14.
Robinson, Stevenson, and Robinson and Son. Apparatus for separating solid particles from air. 12,323. May 16.
Short. Drying machinery. 12,335 and 12,338. May 16.
Urruty. Composition for preventing incrustation in boilers etc. 12,046. May 14. (Fr., 20.12.17.)

COMPLETE SPECIFICATIONS ACCEPTED.

2013 (1917). Du Pont. See XXII.
2746 (1917). Adams, Partington, and Rideal. Catalysts, and the manufacture thereof. (126,715.) May 28.
51 (1918). Loewenstein. Drying apparatus. (126,748.) May 28.
7583 (1918). Milner and Beeby. Apparatus for filtering and straining liquids. (126,447.) May 21.
7875 (1918). Rudge, and United Alkali Co. See VII.
8114 (1918). Smith. Grinding-machines. (126,484.) May 21.
10,910 (1918). Whitham. Grinding or reducing machines. (126,854.) May 28.
17,124 (1918). Joubert. Furnaces. (120,212.) May 21.
18,008 (1918). Ten Winkel. Filtering tanks. (126,574.) May 21.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Appleby and Bentley. Gas-producers. 12,396. May 16.
Armstrong. Manufacture of fuel. 12,621. May 20.
Beswick and Rambush. Working of gas-producers. 13,123. May 24.
Bildt. Producer-gas furnace. 12,923. May 22.
Davies. Distillation of coal, shale, peat, wood, etc. 11,959. May 13.
Dilley. Suction-gas plants. 12,278. May 15.
Dressler, and Dressler, Tunnel Ovens, Ltd. Treatment of coal etc. 12,175. May 14.
Jackson (Fuel Saving Co.). Apparatus for burning pulverised fuel. 13,033. May 23.
Jennings. Apparatus for washing coke etc. 12,983. May 23.
Markle. Fuel, and process of forming same. 12,393. May 16. (U.S., 11,917.)
Merz and McLellan, Mitchie, and Weeks. Retorts etc. 12,111. May 14.
Soc. de Fours à Coke. 11,862. See III.
Wells. Production of charcoal etc. 12,585. May 19.

COMPLETE SPECIFICATIONS ACCEPTED.

- 1802 (1917). Heape and Grylls. Manufacture of carbons for electric arc lamps. (126,673.) May 23.
5974 (1918). Beswick. Gas generators or producers. (126,420.) May 21.
7862 (1918). Boissier. Solid fuel. (115,645.) May 28.
14,673 (1918). Mantle. Treating waste and other lubricating oils to eliminate sulphur etc. (126,882.) May 28.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

- Barnett. Manufacture of nitronapthalene. 12,480. May 17.
Ponchon. Recovery of gaseous or atomised phenol or its homologues from gases. 12,028. May 13. (Fr., 10,518.)
Soc. de Fours à Coke d'Entreprises Industrielles. Extraction of hydrocarbons from oil. 11,862. May 12. (Fr., 13,518.)

COMPLETE SPECIFICATIONS ACCEPTED.

- 17,778 (1916). Datta and Varma. Production of nitrophenols from amido-compounds. (126,321.) May 21.
346 (1917). Clayton Aniline Co., Schedler, and Vuilleumier. Continuous nitration of organic liquids. (126,355.) May 21.
673 (1917). British Dyes, Ltd., and others. See XXII.
1875 and 1876 (1917). Macdonald. See XXII.
2049 (1917). Ellis. Production of aromatic nitro-halogen compounds. (126,685.) May 28.
9603 (1918). Harding. See XX.

IV.—COLOURING MATTERS AND DYES.

APPLICATION.

- Imray (Soc. Chem. Ind. in Basle). Manufacture of azo dyestuffs and intermediate products. 11,891. May 12.

COMPLETE SPECIFICATIONS ACCEPTED.

- 11,068 (1917). Harbottle and Sivertson. Vegetable dyes. (126,742.) May 28.
2652 (1918). Hart. Production of dyes. (126,754.) May 28.

- 4585 (1918). Perkin. Manufacture of N-dihydro 1.2.2'.1'-anthraquinone-azine. (126,764.) May 23.
4586 (1918). Perkin. Manufacture of a dibenz anthrone colouring matter. (126,765.) May 23.
7816 (1918). Imray (Soc. Chem. Ind. in Basle). Manufacture of mordant-dyeing azo dyestuffs and metal compounds thereof, and their application in dyeing. (126,460.) May 21.
10,787 (1918). Holliday and Co., and Law. Chlorination of purpurine and similarly constituted anthraquinone compounds. (126,527.) May 21.
10,788 (1918). Holliday and Co., and Law. Chlorination of alizarine and its substitution products. (126,528.) May 21.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

- Bellwood and Downs. 12,434. See XII.
Dreyfus. Manufacture of cellulose derivatives. 12,369, 12,915, 12,916. May 16 and 22.
Fawcett. Machines for carbonising wool and rags. 12,627. May 20.
Feary. Manufacture of fabric for aircraft. 12,265. May 15.
Herald. Apparatus for treating cotton etc. with liquids or gases. 13,072. May 24.

COMPLETE SPECIFICATIONS ACCEPTED.

- 10,616 (1918). Van Wessem. Manufacture of fibrous pulp suitable for paper-making from sawdust and wood waste. (117,086.) May 28.
11,767 (1918). Lancaster. Treatment of paper articles with paraffin waxes etc. (126,541.) May 21.
13,612 (1918). Brummer. Production of textile fibres. (120,199.) May 21.
14,170 (1918). Clark (Jespersen Paper Co.). Removal of printers' ink from paper stock and preparation of paper pulp. (126,879.) May 28.
21,049 (1918). Dixon. Paper-making machines. (126,916.) May 28.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

APPLICATIONS.

- Calico Printers' Assocn., and Schofield. Producing colour effects on textiles etc. 13,083. May 24.
Lumsden, Mackenzie, and Robinson. Mercerising piece goods. 12,470. May 17.
McMyn. Dyeing and printing. 11,958. May 13.

COMPLETE SPECIFICATIONS ACCEPTED.

- 1183 (1918). Marks (Du Pont de Nemours and Co.). Production of coated fabrics. (126,750.) May 28.
7816 (1918). Imray (Soc. Chem. Ind. in Basle). See IV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

- Amsterdamsche Superfosfaatfabriek. Manufacture of salts of ammonia. 13,108. May 24. (Holland, 10,219.)
Cataldi. Electrolytic decomposition of chlorides. 12,695. May 20. (Ital., 20,518.)
Cocksedge and Freeth. Manufacture of ammonium nitrate. 12,642. May 20.
Hood. Preparation of alumina salts. 12,698. May 20.
Hood. Preparation of solid aluminous materials. 12,699. May 20.

Krotoff. Combustion of sulphur etc. 12,710. May 20. (Fr., 15.6.18.)
 Minton, and United Alkali Co. Apparatus for making flaked caustic soda etc. 13,009. May 23.
 Morel. Manufacture of alumina. 12,494. May 17.
 Morel. 12,495. *See* XVI.
 Piccard. Separating a salt from its solution by evaporation. 12,292. May 15. (Swiss, 14.9.18.)
 Tyrer. Manufacture of alumina from silicious aluminiferous materials. 13,125. May 24.

COMPLETE SPECIFICATIONS ACCEPTED.

17,757 (1916). Chance and Hunt, Calder, and Fox. Condensing the acid fumes evolved during concentration of sulphuric acid. (126,320.) May 21.
 1888 (1917). Freeth and Cockledge. Manufacture of ammonium nitrate. (126,678.) May 28.
 2426 (1917). Maxted and Smith. Manufacture of highly concentrated nitric acid. (126,704.) May 28.
 2703 (1917). Wareing, and United Alkali Co. Purification of sulphuric acid. (126,714.) May 28.
 2746 (1917). Adams and others. *See* I.
 2748 (1917). Adams, Partington, and Rldeal. Oxidation of ammonia. (126,716.) May 28.
 2749 (1917). Adams, Partington, and Rldeal. Production of nitrogen-oxygen compounds. (126,717.) May 28.
 3094 (1917). Jackson (Bombrini-Parodi-Delfino). Preheating apparatus for use in the catalytic manufacture of sulphuric acid. (126,396.) May 21.
 2255 (1918). Norton Co. Products containing β -alumina. (113,960.) May 28.
 2744 (1918). Jenkins and Woolner. Manufacture of permanganates. (126,756.) May 28.
 7875 (1918). Rudge, and United Alkali Co. Apparatus for subjecting matter to the action of gases and vapours, especially for use in making bleaching powder. (126,773.) May 28.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Dressler, and Dressler Tunnel Ovens, Ltd. 12,714. *See* I.
 Rhead. Underglaze decoration for pottery and porcelain. 11,869. May 12.
 Smilh. Treatment of clays and manufacture of articles therefrom. 12,025. May 13.

COMPLETE SPECIFICATIONS ACCEPTED.

19,311 (1917). Danner. Forming sheet glass. (126,747.) May 28.
 2255 (1918). Norton Co. *See* VII.
 2256 (1918). Norton Co. Aluminous abrasive and process of making same. (118,591.) May 21.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Austin. Manufacture of concrete etc. for building. 12,251. May 15.
 Cuming. Treatment of wood waste etc. and utilising it as heat-insulating material. 12,927. May 22.

COMPLETE SPECIFICATIONS ACCEPTED.

7919 (1918). Hadfield and Hadfield. Manufacture of concrete. (126,472.) May 21.
 8395 (1918). Bellonby. Curing concrete products. (126,813.) May 28.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Adams. Prevention of corrosion. 12,017. May 13.
 Angel. Treatment and reduction of complex sulphide etc. ores. 12,851. May 22.

Bingham. Blast furnaces. 12,013. May 13.
 Cadenhead and Goodwin. Recovery of vanadium from iron ores. 12,415. May 16.
 Catterall and Cohen. Furnaces for melting and refining metals. 12,907 and 12,908. May 22.
 Coles. Manufacture of finely-divided metals. 12,178. May 14.
 Harris. Dezincing lead. 12,372. May 10.
 Keller. Manufacture of cast iron. 12,293. May 15. (Fr., 20.3.18.)
 Perez. Method of decomposing mercury. 11,868. May 12. (Spain, 15.5.18.)
 Richards. Distillation of zinc ores etc. 12,824. May 21.
 Whyte. Case-hardening etc. 12,796. May 21.

COMPLETE SPECIFICATIONS ACCEPTED.

519 (1917). Hadfield. Iron-nickel alloys. (126,362.) May 21.
 818 (1917). Hadfield. Treatment of iron and steel turnings, scrap, etc. (126,369.) May 21.
 1003 (1917). Alexander. Recovery of tin and other metals and alloys. (126,377.) May 21.
 11,003 (1918). O'Gorman and Thomas. Indicating the condition of steel etc. when under heat treatment. (126,856.) May 28.
 11,004 (1918). Pope and Thomas. Indicating the condition of steel etc. when under heat treatment. (126,852.) May 21.
 14,575 (1918). Poetschke. Cleaning or purification of powdered or comminuted alloys. (126,881.) May 28.
 20,080 (1918). Metals Disintegrating Co. Process of disintegrating metal. (121,599.) May 28.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Antonoff. Electric batteries. 13,017. May 23.
 Cataldi. 12,695. *See* VII.
 Haviland and Morris. Electrical precipitation of particles from gases. 12,254. May 15.
 Marconi. Electric storage batteries. 12,009. May 13.
 Stockel. Accumulators. 12,952. May 23.
 Svenska Akkumulator Aktiebolaget Jungner. Electrodes for primary cells and storage batteries. 13,029. May 23. (Sweden, 13.6.18.)

COMPLETE SPECIFICATION ACCEPTED.

4089 (1918). Baur and Treadwell. Electric cells or batteries. (126,766.) May 28.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Bellwood and Downs. Extracting oil, fat, grease, etc. from oily or greasy bags, waste wool, etc. 12,434. May 17.
 Firth. Treatment of soya beans to recover oil and produce synthetic milk and flour. 12,268. May 15.
 Jackson (Twitchell Process Co.). Process for splitting fats and oils. 12,287. May 15.
 Longbottom. Soap. 11,871. May 12.

COMPLETE SPECIFICATIONS ACCEPTED.

2528 (1917). Lemmens and Fryer. Production of glycerin. (126,706.) May 28.
 16,150 (1917). Soc. Industrielle de Produits Chimiques. Regenerating catalysts containing nickel and its compounds which have been used for hydrogenating fatty or other organic products. (111,840.) May 21.
 14,673 (1918). Mantle. *See* II.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Grant. Flat oil. 13,048. May 24.
Kuroki and Nakayama. Waterproof paint. 12,343. May 16.

COMPLETE SPECIFICATION ACCEPTED.

15,444 (1918). Hutchins. Manufacture of lamp-black. (126,560.) May 21.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATION.

Dunlop Rubber Co., Hyde, and Worthington. Treatment of raw rubber. 12,928. May 22.

COMPLETE SPECIFICATION ACCEPTED.

5768 (1917). Spence. Devulcanisation of rubber. (12,639.) May 21.

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATIONS.

Pickerden. Artificial leather. 12,185. May 15.
Walpole. Manufacture of glue. 11,917. May 12.

COMPLETE SPECIFICATION ACCEPTED.

10,792 (1918). Johnson, Gregory, and Morrison. Tanning. (126,853.) May 28.

XVI.—SOILS; FERTILISERS.

APPLICATIONS.

Hawker, and Hawker and Botwood. Manufacture of fungicide, insecticide, soil steriliser, and/or fertiliser. 12,397. May 16.
Morel. Manufacture of assimilable phosphates. 12,495. May 17.
Rossi. Manufacture of fertilisers. 11,913. May 12. (Ital., 9.8.18.)

XVII.—SUGARS; STARCHES; GUMS.

APPLICATIONS.

Dupire. 12,020. *See* XVIII.
Lemoine. Separating liquor and remelted syrup in remelting centrifugal machines. 12,244 and 12,344. May 15 and 16.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATION.

Dupire. Manufacture of yeast from fermented musts of molasses and sugar-beet pulp etc. 12,020. May 13.

COMPLETE SPECIFICATION ACCEPTED.

16,840 (1918). Kanegafuchi Boshu Kabushiki Kaisha. Production of an extract of proteolytic enzymes. (126,896.) May 28.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Firth. 12,268. *See* XII.
Greville. Treatment of flour. 13,087. May 24.
Hawker. 12,397. *See* XVI.
Melhuish. Blending milk. 12,659. May 20.
Urruty. 12,046. *See* I.

COMPLETE SPECIFICATIONS ACCEPTED.

7997 (1918). Calvert. *See* XX.
13,157 (1918). Terwen and Van Hoogenhuyze. Manufacture of decolorised, odourless, and tasteless albumins from blood. (123,971.) May 21.
14,940 (1918). Manufacture of cattle-cake from yellow mustard seed. (121,586.) May 21.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Comp. des Prod. Chimiques d'Alais et de la Camargue. Preparation of trichlorethylene from tetrachlorethane. 12,120. May 14. (Fr., 28.1.19.)
Comp. des Prod. Chimiques d'Alais et de la Camargue. Preparation of symmetrical tetrachlorethane. 12,787. May 21. (Fr., 21.3.19.)
Nordiske Fabriken De-No-Fa Aktieselskap. Polymerising unsaturated organic acids at low temperature. 12,598. May 19. (Norway, 4.6.18.)
Verley. Manufacture of nerol. 12,815. May 21. (Fr., 3.5.18.)

COMPLETE SPECIFICATIONS ACCEPTED.

346 (1917). Clayton Aniline Co., and others. *See* III.
2049 (1917). Ellis. *See* III.
16,150 (1917). Soc. Indus. de Prod. Chimiques. *See* XII.
2001 and 2002 (Commercial Research Co.). Manufacture of chlorhydrins. (113,954 and 113,955.) May 21.
7997 (1918). Calvert. Apparatus for producing formaldehyde. (126,479.) May 21.
9603 (1918). Harding. Manufacture of chlorinated hydrocarbons. (126,511.) May 21.

XXII.—EXPLOSIVES; MATCHES.

APPLICATIONS.

Delpach. Production of powder. 12,777, 12,812, 12,819. May 21. (Fr., 30.4 and 15.6.18, and 8.3.19.)

COMPLETE SPECIFICATIONS ACCEPTED.

673 (1917). British Dyes, Ltd., Turner, and Badier. Manufacture of picric acid. (126,368.) May 21.
1875 and 1876 (1917). Macdonald. Manufacture of picric acid. (126,675 and 126,676.) May 28.
2013 (1917). Du Pont. Recovery of solvent from materials such as smokeless powder. (126,682.) May 28.
2117 (1917). Chiaraviglio, and Bombrini-Parodi-Delfino. Explosive substances. (126,687.) May 28.
2329 (1917). Bradley. Explosive compound. (126,608.) May 28.

XXIII.—ANALYSIS.

APPLICATIONS.

Brown and Pickston. Apparatus for automatic and continuous analysis and recording of gases. 12,317. May 16.
Stewart. Apparatus for indicating or recording quantity of oxygen in respirable gases in chambers, tunnels, mines, etc. 12,356. May 16.

COMPLETE SPECIFICATION ACCEPTED.

7825 (1918). Richardson and Avery. Means for testing the hardness of materials. (126,463.) May 21.

I.—GENERAL; PLANT; MACHINERY.

Drying; Counter current —, the temperature of the air current being raised at intervals. K. Wagner. *Gesundheitsing.*, 1918, 41, 461–464. *Chem. Zentr.*, 1919, 90, II., 401.

THE relative weights of water evaporated from materials moving in counter current to, and in the same direction as, the drying current of heated air are respectively 12 grms. and 22 grms. per kilolitre of air employed. This difference disappears if the temperature of the air in the counter-current method is raised from time to time, as it passes from one end of the system to the other. According to this method, in the drying of grain 1900 heat units are required per kilo. of water, compared with 4000–5000 heat units required in most dryers.—J. S. G. T.

Chemical stoneware. Nielsen. See VIII.

PATENTS.

Liquid; Apparatus for the treatment of one with another. Chance and Hunt, Ltd., and A. E. Holley, Oldbury, and O. E. Mott, Woolwich. Eng. Pat. 125,426, 14.7.16. (Appl. 9928/16.)

THE general arrangements described in Eng. Pats. 124,461 (this J., 1919, 390 A) and 125,140 (this J., 1919, 442 A) are used for bringing about physical or chemical interactions between two liquids (including suspensions, emulsions, and solutions) of different specific gravities and not completely miscible. Provision may be made for heating or cooling the liquids.—T. St.

Furnaces; Liquid-fuel heated —. D. Wright, Ulverston, Lancs. Eng. Pat. 125,629, 25.9.16. (Appl. 13,548/16.)

A FURNACE heated by liquid fuel, and an auxiliary chamber, are arranged side by side and separated by a vertical wall having two ports converging into the auxiliary chamber. An oil-gasifying tube passes through the auxiliary chamber, and projects through the division wall into the furnace where its outlet is contracted. The tube is provided with internal longitudinal blades and with transverse baffles. Oil is supplied by a sight feed device to a tube terminating within the gasifying tube and provided with a rotary atomiser at its outlet. Any unevaporated oil is compelled by the baffles to take a tortuous course. Air for combustion is supplied through a pipe passing round the periphery of the auxiliary chamber, and opening into the gasifying tube and surrounding the oil supply pipe. When in use, the hot gases from the furnace chamber pass back through the converging ports into the auxiliary chamber to heat the air and gasify the oil. Outlets are provided from the furnace and auxiliary chamber.—W. F. F.

Expressing liquid from materials containing the same; Apparatus for —. J. W. Hinchley, London. Eng. Pat. 125,672, 5.7.17. (Appl. 9683/17.)

THE material to be treated, e.g., clay, peat, lead paste, etc., is contained within a cylindrical chamber wherein it may be subjected to pressure. The pressed material is extruded from the chamber by way of nozzles furnished with dies of such size that the necessary pressure may be maintained within the chamber. Prior to passage through the nozzles, the material comes into contact with filtering surfaces in the form of plates of rigid porous material, such as pottery, suitably supported, through which liquid is expressed from the material. A separate chamber is provided for the passage of the ex-

pressed liquid, and if desired, the material within the chamber may be heated before or while undergoing the filtering action.—J. S. G. T.

Removing suspended particles from gases [air]; Apparatus for —. S. F. Barclay, Sheffield. Eng. Pat. 125,681, 25.1.18. (Appl. 1495/18.)

THE gas is passed through a conduit, wherein it is subjected to a high-tension discharge by passage through an electrified network furnished with a number of discharge points, and suitably insulated. The field is such that the particles are impelled in the direction of the gas current. The high-tension current may be either direct or alternating, and in the latter case, two or more networks, insulated and suitably disposed in the channel, are employed. The electrified suspended particles are collected on plates sprayed with water, arranged so that the gas current passes between them, eddies being produced by changes of direction of the gas current. Alternatively a mist of spray may be employed for the collection of the particles. Eliminators furnished with curved lips are employed to remove any free moisture carried over from the wet plates.—J. S. G. T.

Separator; Electric —. C. W. J. Hedberg, New Britain, Conn., Assignor to Research Corporation, New York. U.S. Pat. 1,297,159, 11.3.19. Appl., 7.2.18.

AN apparatus for separating and grading material comprises an electrode arranged to form a vertical passage, which is surrounded by a vertical series of receiving chambers. A discharge electrode extends centrally into the passage for producing a transverse electric stress, by means of which the material is separated. The contents of the several receiving chambers are collected separately.—B. N.

Separating finely-divided materials; Process and apparatus for —. W. A. Schmidt, Assignor to International Precipitation Co., Los Angeles. U.S. Pat. 1,298,409, 25.3.19. Appl., 17.10.16.

A CURRENT of gas containing suspended matter is caused to flow with such velocity that the coarser particles in suspension are separated from the gas by the mechanical action of a force dependent on the mass of the particles, the finer particles remaining in suspension being subsequently removed by electrical precipitation.—D. F. T.

Spraying liquids; Means for — and mixing thereof with other liquids or gases. R. B. Hoffmann, London. Eng. Pat. 125,809, 6.6.18. (Appl. 9319/18.)

THE injector of a spraying device is situated below the level of the surface of the liquid to be mixed, and is supplied with liquid under pressure. The induced current of liquid passes through a straining plate, and thence, with the inducing liquid, through a pipe connected to the sprinkling head situated above the level of the liquid surface. The device may be provided with air induction chambers, with ports or orifices surrounding the liquid jet. The entrances for air to such chambers are situated above the level of the surface of the liquid.—J. S. G. T.

Filter presses and the like. J. Miller, and G. Fletcher and Co., Ltd., Derby. Eng. Pat. 126,265, 13.2.19. (Appl. 5530/19.)

THE end plate of a horizontal filter press is connected to the ram of a hydraulic press on the same axis by means of a rod which is pivoted on a horizontal axis adjacent to the hydraulic cylinder and counterweighted so that it may be rotated in a

vertical plane out of line with the axis of the ram. The other end of the rod is screw-threaded and provided with a hand-operated nut forming a pressure head which may bear against the end plate of the press. The apparatus provides a means for rapidly closing the press by moving up the end plate, and swinging the rod into line and screwing up its pressure head to apply a preliminary pressure, after which the hydraulic ram is brought into operation for the final pressure.—W. F. F.

Drying apparatus. H. Bogaty, Assignor to The Philadelphia Textile Machinery Co., Philadelphia, Pa. U.S. Pat. 1,298,285, 25.3.19. Appl., 11.9.18.

A SERIES of cars is moved by a differential screw through a horizontal drying chamber in which air is circulated.—W. F. F.

Drying process [for carbonaceous materials]. S. E. Seaman, Brooklyn, N.Y., Assignor to Seaman Waste Wood Chemical Co., New York. U.S. Pat. 1,299,791, 8.4.19. Appl., 4.6.17.

FINELY divided material and hot gases from a furnace are introduced into one end of a horizontal drying chamber at adjacent points so as to be mixed together. The mixture is drawn through the drying chamber by suction, and the waste gases and steam are separated from the dried material at a distance from the chamber beyond the reach of sparks. The dried material is fed directly to a retort.—W. F. F.

Centrifugal machine. T. A. Bryson, Troy, N.Y., Assignor to Tolhurst Machine Works. U.S. Pat. 1,298,451, 25.3.19. Appl., 14.5.15.

THE lower end of a vertical rotating shaft carrying a separating basket is supported below the basket on a spherical bearing. An annular guard is provided between the bearing and the openings in the bottom of the basket and comprises a concentric conical member, to the bottom of which an annular member is attached extending upwards towards the openings in the basket.—W. F. F.

Evaporating apparatus. S. M. Dick, Assignor to F. E. Mick, Minneapolis, Minn. U.S. Pat. 1,298,470, 25.3.19. Appl., 13.12.17.

LIQUID is sprayed into the top of a casing and hot air is supplied through spaced openings in the upper part of the side wall of the casing. Air at a higher temperature enters through openings at the bottom of the casing, and outlets are provided at various points in the wall at different levels. A number of circular currents of hot air are thus formed in the casing to evaporate the sprayed liquid.—W. F. F.

Evaporator. W. E. Garrigues, New Orleans, La., Assignor to W. Garrigue and Co., New York. U.S. Pat. 1,298,925, 1.4.19. Appl., 28.9.17.

A SERIES of vertical tubes is arranged between horizontal tube-plates in the lower part of a vertical casing leaving a central space free from tubes. A heating medium is introduced into the bottom of the central space and circulates outwards over the tubes, the circulation being assisted by baffles between the tubes and above the upper tube-plate. Liquid to be evaporated is caused to circulate downwards through the outer tubes, through the slightly conical space below the lower tube-plate towards the centre, and then upwards through the inner tubes. Precipitated matter is removed at the centre of the lower conical space.—W. F. F.

Liquids; Apparatus for evaporating or concentrating —. E. Shaw, Toronto. U.S. Pat. 1,299,798, 8.4.19. Appl., 31.5.17.

A VERTICAL annular steam jacket surrounds an inner concentric tube tapering downwards and provided with a helical rib on its outer side so as to form a helical passage of gradually increasing cross-section downwards. The inner tube terminates a short distance from the bottom of the jacket, and the liquid to be concentrated passes downwards through the helical passage and then continues to flow over the inner wall of the steam jacket to the outlet at the bottom. Vapour from the liquid passes upwards through the lower open end of the inner tube and thence to the outlet.—W. F. F.

Aqueous fluids [steam]; Method and apparatus for measuring the rate of flow of —. E. G. Bailey, Newton Highlands, Mass., Assignor to Bailey Meter Co. U.S. Pats (A) 1,299,539 and (B) 1,299,540, 8.4.19. Appl., 28.12.17 and 16.7.15. (B) Renewed 25.10.18.

CARBON dioxide is introduced at a known rate into a closed conduit through which steam is flowing, and a sample of the mixture then taken. The sample is passed into a separating chamber where it is heated to 100° C. and the steam removed by condensation. The ratio of steam to gas in the sample is thus ascertained and from this the rate of flow of steam in the conduit.—W. F. F.

Pump; Vacuum fluid —. W. von Dallwitz, Heidelberg. Ger. Pat. 308,313, 17.11.14.

THE combustion of a combustible mixture operates a freely moving piston to and fro in such manner that a vacuum is produced, which can be employed to effect ventilation, or for the removal of slimy masses.—J. S. G. T.

Evaporator for refrigerating machines. C. Schmitz, Hagen. Ger. Pat. 310,880, 5.12.16.

HOLLOW ribs functioning as surfaces of evaporation are arranged within a vessel forming a gas-liquid separator, and are proportioned so that the free cross-sectional area of the vessel increases from below upwards. A brisk exchange of heat takes place between the cold medium and the material to be cooled. The relative increase of area from below upwards is proportioned to the capacity of the machine. The velocity of the liquid-vapour mixture is much diminished as it passes upwards through the separator, and a perfect separation of liquid from vapour is thereby secured, the vapour passing over to the condenser, the liquid returning to the lowest point of the vessel.—J. S. G. T.

Desiccating-machine. J. W. Stamp, Melbourne, Australia. U.S. Pat. 1,299,254, 1.4.19. Appl., 15.7.18.

SEE Eng. Pat. 114,700 of 1917; this J., 1918, 321 A.

Evaporator. R. C. Jones, Garden City, N.Y., Assignor to The Griscom-Russell Co. U.S. Pat. 1,299,955, 8.4.19. Appl., 1.2.16.

SEE Eng. Pat. 103,820 of 1916; this J., 1917, 995.

Fire-extinguisher. Ger. Pat. 310,890. SEE V.

Extracting oils etc. Eng. Pat. 126,262. SEE XII.

Mixing apparatus. Eng. Pat. 125,094. SEE XXII.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Nitrogen in coal and coke; Determination of —
F. Terres, H. Fleischer, H. Hansen, J. Köchling,
and O. Malsch. J. Gasbeleucht., 1919, 52, 173—
177, 192—200.

In spite of the known limitations of the Kjeldahl method, its convenience has led to its universal adoption for the analysis of fuels, without, however, direct proof of reliability. Simmersbach and Sommer (this J., 1916, 102) recommend the substitution of a modification of the Dumas method. The authors have compared the three methods in question. The Dumas method was modified so as to permit the generation in the tube of a supply of oxygen. A mixture of potassium chlorate and manganese dioxide was introduced into the tube containing sodium bicarbonate. By heating the mixture a combustion with oxygen of the residual coke-copper oxide mixture was effected when the visible evolution of nitrogen had ceased, and a further evolution of nitrogen obtained. This necessitates an analysis of the gas collected to determine the oxygen, carbon monoxide, methane, etc. which are always found even if the combustion is most carefully carried out. The Simmersbach-Sommer modification was followed substantially as described by those authors but an after-combustion of the coke residue was found necessary also. The Dumas modification of the Kjeldahl method was used in general—1 gm. of coal to 50 c.c. of sulphuric acid and 10 grms. of potassium sulphate without catalyst—heating being continued until a clear solution was obtained. The results were variable according to the conditions and always lower than those given by the other two methods, which were in substantial agreement. It was shown by heating ammonium sulphate with the potassium sulphate-sulphuric acid mixture for 20 hours that the cause was not an oxidation of the ammonia once formed. A modification of the Kjeldahl method was devised whereby it was possible to collect the gases evolved in the oxidation of the coal and determine their nitrogen content. With this comparative experiments were made on a number of typical fuels, and the results are tabulated:

Method		Temp. of oxidation	Peat	Lignite	Saar coal	Ruhr coal	Anthracite
		°C.	% N ₂	% N ₂	% N ₂	% N ₂	% N ₂
Kjeldahl		250	1.70	0.80	1.31	1.33	1.35
"		275	1.56	0.76	1.23	1.26	1.34
"		300	1.46	0.62	1.15	1.20	1.24
"		325	(14 hrs.) 1.36	(35 hrs.) 0.58	(44 hrs.) 1.00	(74 hrs.) 1.07	(52-59 hrs.) 1.13
Kjeldahl + free nitrogen		—	1.77	1.20	1.76	1.58	1.84
Dumas with after-combustion		—	1.72	1.08	1.73	1.55	1.72
Kjeldahl + HgO		300	1.66 (2.5 hrs.)	0.97 (3 hrs.)	1.35 (6.5 hrs.)	1.35 (7.5 hrs.)	1.31 (11 hrs.)
Kjeldahl + HgO + CuO		300	1.56 (4 hrs.)	0.93 (4.8 hrs.)	1.25 (7 hrs.)	1.36 (8 hrs.)	1.38 (10 hrs.)
Kjeldahl		275	Peat coke 0.82	Lignite coke 0.55	Saar coke 1.11	Ruhr coke 1.53	Anthracite coke 1.49
"		300	0.73	0.52	1.01	1.46	1.27
"		325	0.71	0.44	0.98	1.34	1.22
Dumas with after-combustion		—	0.89	0.62	1.43	1.59	1.79
Kjeldahl + free nitrogen		—	0.95	0.73	1.48	1.68	1.85

The simple Kjeldahl method gives results which are lower than those of the modified Dumas method to a degree varying with the time and temperature of the oxidation process, and also with the fuel taken. The lower the temperature the less is the loss of nitrogen, and if allowance is made for this the results agree with those of the Dumas method. The discrepancy is less with coked products. In

the presence of catalysts higher results (though still too low) are obtained owing to the reduced time and temperature of the oxidation. The production of ammonia is a process of hydrolysis.

—H. J. H.

Coal; Action of chemical reagents on — S. Hilpert, K. Keller, and R. Lepsius. Ges. Abhandl. zur Kenntnis der Kohle, 1917, 1, 22-25. Chem. Zentr., 1919, 90, II., 441-442.

BITUMINOUS coal (Osterfeld Mine) when heated with acetic anhydride and zinc chloride in a sealed tube gives a coal-like substance without coking properties and yielding acetic acid when heated. By nitration with sulphuric and nitric acids (1:1) the nitrogen content of the outwardly unchanged coal increased from 1.8 to 3%. The "nitro-coal" is soluble in acetone and acetic acid, insoluble in benzene and other hydrocarbons. The dissolved substance closely resembles the insoluble residue and decomposes on heating. It is soluble in aqueous alkalis with partial saponification and is re-precipitated by acid. The coal when heated with fuming sulphuric acid gives no sulphonic acids, which together with the ready saponification of the nitro-products does not suggest the presence of aromatic hydrocarbons (cf. Pietet and Bonvier, this J., 1913, 1068). Extraction with dichlorobenzene or pyridine yielded substances of the same composition as the insoluble residue. Treatment with bromine gave carbonaceous products which on heating evolved much hydrobromic acid, leaving a powdery coke. The absorbed bromine could be removed by alcoholic potash.—H. J. H.

Coal and similar substances; Conversion of into soluble products by ozone. F. Fischer and H. Niggemann. Ges. Abhandl. zur Kenntnis der Kohle, 1917, 1, 30-42. Chem. Zentr., 1919, 90, II., 442.

THE method of ozonisation (this J., 1916, 1001) has been applied to all types of coal, including samples freed from bitumen by extraction under pressure, and also peat and humic acid. The coal or the like, suspended in water, was exposed for twenty hours to the action of ozone. The products obtained were easily soluble in water and alcohol, and slightly

soluble in other neutral solvents, black or brown in colour, strongly acid in reaction, hygroscopic, soft at 100° C., brittle at the ordinary temperature, had a caramel-like odour, and decomposed at about 100° C. with the liberation of carbon dioxide. Cellulose, graphite, coke, and charcoal were only slightly attacked by ozone and yielded products of different character. The reactivity to ozone is therefore

characteristic of humic substances. Among coals it was found that the quantity of soluble products increased with decreasing coke yield. The frothing which accompanies ozonisation increased in the same order. Peat gave a smaller yield of products than lignite. Cannel coal yielded only a small amount of ozonised product in spite of its low yield of coke. Anthracite gave 48% of water-soluble products after treatment with ozone for 300 hours and lost 86% in weight. Coals free from bituminous constituents behaved towards ozone similarly to the raw coal. The bituminous matter is therefore not the constituent which becomes soluble. The yield of product from lignite was not diminished by the removal of humic acid. Ozonisation was accompanied by the liberation of carbon dioxide. The ozonised products began to decompose slowly at about 115° C., becoming gradually insoluble in water. At 250° C. the products were completely insoluble in water, but still soluble in alkalis. The ozonised product dried at 110° C. contained 3% hydrogen, 50.3% carbon, 0.8% sulphur, traces of nitrogen, the original coal containing 5% hydrogen, 84.4% carbon, 0.9% sulphur. The product apparently dissolves in water to a colloidal solution. On evaporating the solution acid vapours are evolved, which contain small quantities of the lower fatty acids. Mellic acid is apparently not formed. The yield of oxalic acid seems to depend on the conditions of ozonisation, and perhaps the temperature of solution and crystallisation of the oxalic acid from the product. On boiling the brown solution with animal charcoal most of the substance is removed by adsorption, but the solution does not lose its colour and smell.—H. J. H.

Coal; Extraction of previously heated — F. Fischer and H. Gröppel. Ges. Abhandl. zur Kenntnis der Kohle, 1917, 1, 68–77. Chem. Zentr., 1919, 90, II., 442–443.

The low yields obtained in extracting coal by inert solvents can be increased by preheating the coal for a short time at a suitable temperature. The structure of the coal is somewhat broken down so that the tar-forming products can be completely extracted. By rapid cooling further decomposition is prevented (cf. Harger, this J., 1914, 391). The temperature necessary was fixed at 550°–600° C. The liberation of tar was a maximum at 440°–550° C. The preheated coal was rapidly cooled, powdered, and extracted in succession with petroleum spirit, benzene, and chloroform. The solvents were removed by heating the extracts on the water-bath at slightly reduced pressure. The petroleum spirit extract is yellowish and leaves a dark brown oil of butter-like consistency. A cream-coloured mass, probably paraffins, separates when this is dissolved in alcohol. On extraction with acids bases are removed smelling of pyridine, while phenols are extracted by alkalis. The benzene extract is deep brown with greenish fluorescence and leaves a tarry residue. The residue of the chloroform extract, which is green by reflected light and reddish-brown by transmitted light, solidifies to a resin-like mass. Cannel coal gives a distillate resembling vaseline. The yield of coke from the extracted residue amounts to 80–86%. Specially good results were obtained with the gas coals and cannel coals.—H. J. H.

Town's gas; Effect of inert constituents on the efficiency of — R. Lessing. Gas J., 1919, 146, 489–493.

THE nitrogen content of coal-gas derived from the coal may vary with a make of 12,500 cub. ft. per ton, from 0.6 to 1.1%. The residual nitrogen derived from the steam used in water-gas making

does not exceed 0.03%. The air required for combustion of various gaseous mixtures, containing up to 50% of inert constituents, is calculated and it is shown that the percentage of combustible gas in the resulting mixture varies very little. The size, form, and temperature of the flame produced depend upon the percentage of combustible gases present, non-combustibles lowering the flame temperature considerably. The efficiency of heating as affected by flame temperature is discussed in relation to low temperature heating, high temperature heating, and the use of gas in gas engines. Gas engine efficiency is not dependent upon high calorific value of the gas or freedom from non-combustible gases. The author considers that the limit of admixture of blue water-gas should be about 30%. The volume increase in the yield of gas per ton of coal carbonised at higher temperatures is due to the degradation of the gas, accompanied by a deposition of carbon, whereby the carbon:hydrogen ratio is lowered, and the use of such high temperatures is not regarded as desirable. By complete "stripping" of coal gas of its benzene, toluene, xylene, etc. the calorific value is lowered 6.3%. The author concludes that town's gas should be made and sold on the calorific value basis. Aromatic hydrocarbons including naphthalene should be extracted. The calorific value need not exceed 550 B.Th.U., and for 90% of the gas supplied may fall well below this figure. A high calorific value should not be obtained by carburization, but by such means as increasing the methane content of the gas. The yield of gas per ton of coal should be approximately 12,000 cub. ft. The percentage of non-combustible constituents should be reduced to a minimum.

—J. S. G. T.

Gasification process [in gas producers]; Theory of the — W. Ostwald. Chem.-Zeit., 1919, 43, 229–231.

THE process of gas production utilising coal, water, and air is resolved into three fundamental processes represented by the thermochemical equations:—

- (1) $C + O_2 = CO_2 + 97.6$;
- (2) $C + 2H_2O = CO_2 + 2H_2 - 18.8$;
- (3) $C + CO_2 = 2CO - 38.8$.

Assuming that relative proportions, a, b, and c of the coal employed undergo these relative changes, the author shows how, utilising the analysis of the resulting gas, the complete process may be represented by means of a diagram employing triangular co-ordinates after the manner introduced by Gibbs. The area of the triangle of reference is divided into two fields, viz., a region of combustion and gasification and a region of regeneration of combustible gas from combustion products. The characteristics of various technical producer gases are examined by means of the areas so defined. The method allows the effects of alteration of working upon the course of the reactions involved, to be followed, as well as the general thermochemical and volumetric characteristics of the process. (See also J. Chem. Soc., July, 1919.)—J. S. G. T.

Benzol extraction [from gas]; Heavy oil for — St. Claire Deville. J. Usines à Gaz. Gas J., 1919, 146, 434.

THE best oil for benzol extraction from coal gas is similar to that found suitable for naphthalene extraction and is prepared as follows:—Anthracene oil is distilled to 270° C. and the residue strongly cooled. The liquid portion is filtered off and used for benzol extraction. No ordinary cooling causes it to thicken and on the other hand it yields only the products (benzol and naphthalene) extracted from the gas when distilled at a temperature con-

siderably below 270° C. The oil prepared as above with the addition of 4% of benzol represents the German oil called "Bueb" used for naphthalene extraction. The added benzol in this case prevents the stripping of that constituent from the gas.

—T. F. E. R.

Toluol recovery [from gas]. R. S. McBride, C. E. Reinicker, and W. A. Dunkley. U.S. Bureau of Standards. Technol. Paper 117, 1918. 60 pages.

The paper comprises a description of American toluol-recovery plant construction and methods of operation, with a discussion of the results which can be obtained, and a brief outline of the cost of the process (see this J., 1917, 1265); a discussion of the relation of toluol recovery to standards of quality for gas service (see this J., 1918, 174 A); and a typical form of contract for use in connection with the operation of toluol-recovery plants in gas works.

Fuel gases; Efficiency of different industrial —. E. Dolensky. J. Gasbeleucht., 1919, 62, 137–141, 152–156, 162–166.

The various factors which require consideration in comparing the efficiency in industrial practice of various fuel gases are discussed. The cost of the unit of heat is not in itself decisive, as the unit of heat in different forms of fuel is not necessarily of equal value. Special adaptability to the purpose in view may outweigh disadvantages. High flame temperature is very conducive to efficient heating, and in this respect water-gas is superior to other fuel gases. Rapidity of ignition and propagation of flame are important. These are influenced by the degree of dilution of combustible by inert constituents in the theoretical mixture of fuel gas and air. The dilution is greatest in rich coal gas and least in water-gas, and thus it is found that rapid and complete combustion of the latter is attained with a minimum excess of air. The various thermal and physical quantities necessary for the study of a number of typical fuel gases are tabulated and set out graphically so as to show the relationship between conditions of use and attainable efficiencies. The temperature of the flue gases is here dominant, and this can, and in the case of the low-grade gases often must, be lowered by recuperation or regeneration of heat. In practice about 50%, or at best about 60% only, of the waste heat can be recovered in this way, and in general it does not seriously alter the order of the relative efficiency of the various gases. The high-grade gases can almost invariably be used with a higher thermal efficiency than producer gases. The latter if not cooled may carry such a water content as to render nugatory the advantages of regeneration, whereas richer gases are always clean and approximately free from water. Although it is usually assumed for low-grade producer gas that no gas-holder is required, in practice this is often a doubtful advantage, as it is attended by irregularities of pressure, composition, and water content. The ultimate thermal efficiency can only be ascertained when the fuel consumption is referred back to the original coal from which the gas was made, and here the high-grade gases show to advantage.—H. J. H.

Oil; Production of — from mineral sources. F. M. Perkin. J. Inst. Petroleum Tech., 1919, 5, 75–93. (See also this J., 1918, 471 B.)

A SCOTTISH peat with 14.6% of moisture yielded per ton:—spirit 1.9 galls., fuel oil 13.8 galls., paraffin wax 21.0 lb., phenols 1.6 galls., and retort carbon 50.0 lb. The lignites and brown coals of Devonshire have yielded from 33 to 35 galls. of crude oil per

ton of air-dried material retorted. The coke remaining was tested on a suction-gas plant with very satisfactory results. The quantity of oil and of ammonium sulphate yielded by shales varies considerably. The yield of oil may be as high as 30–40 galls. per ton of shale, but is sometimes as low as 17–18 galls. The present average yield in Scotland is 23 galls. per ton. The amount of shale treated in the Scottish retorts is over 3,000,000 tons per annum, yielding (before the war) 275,000 tons of crude oil, or over 70,000,000 galls. The Bryson retort generally used is long and narrow and is specially designed to yield the maximum amount both of oil and ammonia. The oil is produced in the upper cooler portion of the retort and the ammonia in the lower hotter portion, where the shale which has been freed from the main portion of the volatile matter is acted upon by superheated steam. Thus the retorting of shale is a low temperature process as regards the production of oil, and moderately high for the production of ammonia. Coal tar pitch may be made to yield over 20 galls. per ton of fuel oil by heating to 600°–650° C. and re-distilling the heavy tar distillate. It is estimated that if all the coal employed for domestic purposes were to be partially carbonised, and the yield of crude oil be reckoned at the very low rate of 20 galls. per ton, the production of oil would be 700,000,000 to 900,000,000 galls. (2,900,000 to 3,750,000 tons) per annum, and taking the yield of ammonium sulphate at 10 lb. per ton of coal carbonised, the production would be 156,000 tons per annum. In addition to coal suitable for domestic purposes, there are large amounts of coal dust and coal with high ash which also might be profitably treated by the low temperature process. In low-temperature carbonisation either good or poor coal can be employed but in high-temperature practice it is always advisable to use the best. Other sources from which small quantities of oil are obtained are blast furnaces and producer-gas plants in which coal is used. Blast furnaces yield a heavy tar from which heavy and light fuel oils are obtained. The oils appear to be intermediate between true low-temperature oils and the products obtained at the high temperatures of the gas retorts. They contain sometimes as much as 25% of tar acids. The production amounts to only a few million galls. per annum. Producers using coal yield a tar which on distillation gives fuel oils. This is a low-temperature product as the temperature at the top of the producer does not as a rule exceed 600° C. and may be lower. Brief descriptions are given of the methods used in the recovery of oil from the Scottish shales, and of various types of retort designed for low-temperature distillation of coal.—T. St.

Russian masut; Cracking of —. Improved methods for the rational utilisation of petroleum. O. Aschan. Översigt af Finska Vetenskaps-Soc. Förhandlingar. Reprint. Pp. 70.

At the present time after distilling off the benzine and kerosene from Russian crude oil there is left a residue, masut, of which about 10% is worked up for gas oil and lubricants and the remainder used as fuel, the calorific value of which averages 10,000 to 11,000 cal. Balachany crude oil yields 4% of benzine (up to 150° C., sp. gr. 0.770), 33% of kerosene (150°–300° C., sp. gr. 0.825), and 62% of masut (above 300° C., sp. gr. 0.912). The masut on being distilled in a current of superheated steam yields: 30% of gas oil (sp. gr. 0.870–0.875), 7.5% of light and heavy spindle oils (sp. gr. 0.875–0.905), 24.0% of machine oil (sp. gr. 0.905–0.912), 1.5% of light cylinder oil (sp. gr. 0.912–0.920), and 35.0% of tar (goudron) (sp. gr. 0.920–0.950). The tar may

be refined by means of acid and alkali and then on steam distillation yields heavy cylinder oils (viscosines). The products represent more than double the value of the same quantity of the crude oil. Seeing that the markets for the fully refined products only account for 10% of the masut, the author's attention was turned to the possibility of destructive distillation. The initial stage of cracking sets in about 250° C. The more complicated molecules are decomposed but there is no profound decomposition. True cracking begins at about 300°–400° C. and hydrogen is eliminated, whilst the molecules of intermediate complexity undergo scission, partly forming light products (benzine and kerosene) and partly tars. The former bodies result from analytical and the latter from synthetic changes. If the process is carefully conducted under high pressure the point of scission is directed more towards the middle of the molecule with the formation of a preponderance of fluid products, mainly light oils. There is also a smaller gas yield and the high-boiling tough residues are poor in hydrogen. If, on the other hand, the pressure is diminished, the point of rupture is displaced more and more towards the ends of the molecule. This results in the production of much heavier and also of much lighter molecules. Typical of the latter case is the production of oil gas from the destructive distillation of gas oil at 700° to 800° C. The oil gas has a very high calorific and illuminating value and is accompanied by much tar and low-boiling hydrocarbons which may be removed by compressing and cooling. Extreme cases of the destructive distillation under the conditions just specified are the cracking of aromatic hydrocarbons at temperatures above 800°–900° C. Here the gas yield is greater but the calorific value is lower than that of oil gas. At still higher temperatures ranging from 1000° to 1200° C., methane, hydrogen, and carbon are the chief products. The yields and analyses from a large number of gas oils are tabulated. The oil gas was compressed at 10 to 18 atmospheres pressure and the condensed liquid examined. On fractionation isoprene, benzene, and toluene were identified, also condensation products on treatment with aluminium chloride. The author recommends the pyrogenetic formation of isoprene and aromatic hydrocarbons from the liquid condensed from oil-gas as a better method of utilising masut. At the Abo oil-gas works the gas from 200,000 kilos. of masut gas oil yielded a condensed liquid containing 324 kilos. of pure isoprene, 3050 kilos. of benzene, 1120 kilos. of toluene, and 2969 kilos. of oil-gas benzine. The value of the products obtained from the working up of masut in this way is 2½ times that yielded by the usual method. The author suggests that the total masut should be treated as follows: 10% for fully refined products (lubricating oils, etc.), 45% for fuel, 45% for cracking. In this case there would be formed from 2,584,000 tons of masut, after cracking: 1,196,746,000 cub. m. of oil gas, 4,186,080 kilos. of isoprene, 68,463,080 kilos of benzene, 12,558,240 kilos. of toluene, and 11,498,800 kilos. of oil-gas benzine.

—A. E. D.

Petroleum oils; Cracking — to obtain petroleum spirit and aromatic hydrocarbons. A. P. Lidoff. *Petroleum*, 1917, 12, 413–427. *Chem. Zentr.*, 1919, 90, II., 290.

In "cracking" solar oil in the presence of ferric chloride or aluminium chloride it is advantageous to form the anhydrous catalyst during the process. For this purpose the oil is mixed with iron or aluminium and a current of hydrogen chloride gas passed through the mixture, whereby the resulting nascent hydrogen promotes the formation of saturated compounds. The process takes from 2 to

3 hours at 250°–280° C. In this way solar oil treated with iron as catalyst yielded 65% of distillate of sp. gr. 0.865, whilst with aluminium as catalyst the yield was 70%. The decomposition products are saturated compounds of pleasant odour, and do not alter in the air. The highest yield of aromatic compounds is obtained by cracking at 600° C. under a pressure of 18 atmos.

—C. A. M.

Bitumen; Concentration of the optically active constituents of — by means of ozone. J. Tausz. *Chem.-Zeit.*, 1919, 43, 225.

WHEN crude petroleum is treated with ozone, ozonides are precipitated. By more prolonged treatment with ozone, other products are formed which, unlike the normal ozonides, are not completely insoluble in petroleum spirit, but may be converted into insoluble products by addition of caustic soda or anhydrous tin tetrachloride. Experiments have been carried out with two kinds of asphalt, a crude oil, and a bitumen. The solution thereof in petrol spirit was evaporated, the residue dissolved in chloroform, and ozonised. The ozonisation was stopped when the liquid cleared. Thereafter the oil was treated with anhydrous tin tetrachloride, then with caustic soda, and considerable petroleum spirit and filtered. The optical activity of the filtered oil was determined after evaporation of the petroleum spirit. The process of solution, ozonisation, etc. was repeated a number of times. The process did not yield well-defined products, resins alone being invariably obtained. Syrian asphalt yielded an oil which in a tube 20 cm. long gave an optical rotation at 30° C. $\alpha = 1.40^\circ$, the corresponding values for the oils derived from Val de Travers asphalt, and a crude petroleum from Alsace being respectively $\alpha = 3.4^\circ$ at 30° C. and $\alpha = 1.8^\circ$ at 20° C. A fraction from Wels bitumen (b.pt. 270°–275° C. at 14 mm. mercury pressure) and possessing an optical activity in a 20 cm. tube of 20.8 saccharimeter degrees yielded an oil with a rotation of 40 saccharimeter degrees in the same tube.—J. S. G. T.

Tar lubricating oil. Bruhn. See III.

PATENTS.

Coal and the like; Washers for —. W. R. Stobart. Bishop Auckland, Durham. Eng. Pat. 125,781. 30.4.18. (Appl. 7246/18.)

A HOPPER mounted on a weighbridge is charged at the top with coal to be washed and the washing water enters at the bottom. The material is agitated by a revolving stirrer and the washed coal discharged at the top at another point. The weighbridge tips with a predetermined amount of heavy material in the hopper and completes an electric circuit which operates mechanism to discharge the material in the hopper. After discharge, the current is interrupted till the weighbridge tips again.

—W. F. F.

[Furnace] apparatus for burning powdered fuel. A. S. Mann, Schenectady, N.Y., by E. D. Mann, Administratrix, Assignor to General Electric Co. U.S. Pat. 1,298,530, 25.3.19. Appl. 20.7.16.

A FURNACE is provided with a series of burners across the front for burning powdered fuel. Each burner is closed at its outer end, and powdered fuel and air are fed into it tangentially. The tangential inlets of adjacent burners are on opposite sides so as to produce rotation in opposite directions.

—W. F. F.

Coke ovens; Horizontal — E. O. R. Marks, London. From Soc. Franco-Belge de Fours à Coke, Brussels. Eng. Pat. 126,180, 23.5.18. (Appl. 8583/18.)

In horizontal coke ovens with by-products recovery, heat regenerators are provided under the ovens. Each half of the pier walls of the ovens is furnished with a combination of vertical and horizontal flues, together with suitable floor flues forming a symmetrical arrangement of two distinct and equal circuits, each connected at one end to one of the heat regenerators, which are arranged in pairs. The respective circuits are provided with burners, and the products of combustion pass to the other heat regenerator of the several pairs. The two circuits are traversed in reverse directions during the same period by currents of gas in combustion. Dampers are provided in the various flues, that in the floor flue operating also as a shutting-off device.

—J. S. G. T.

Gas retorts. F. J. Bancroft and J. B. Hansford, New Barnet, Herts. Eng. Pat. 126,121, 27.4.18. (Appl. 7131/18.)

COAL or other material is fed into the lower end of a vertical retort of the intermittent or continuous type, and is forced upwards by means of a suitable device such as a screw conveyor. Definite quantities of oxygen or air and steam are introduced into the top of the retort, and pass downwards through the heated carbonaceous mass, the temperature of which increases from bottom to top. The gases generated are removed through exits in the bottom of the retort, which is the coldest zone in the retort.—J. S. G. T.

Gas producers and method of working the same. J. Stewart, Glasgow. Eng. Pat. 125,686, 6.2.18. (Appl. 2132/18.)

A MULTIPLE-CHAMBER gas producer comprises one or more horizontal down-draught chambers, and a vertical up-draught chamber. If desired, the down-draught chambers may be inclined at an angle to the horizontal. The outlet ends of the horizontal chambers open into the vertical chamber near the upper end. The operation of a sliding grate at the rear end of the horizontal chambers controls the supply of heated fuel from the horizontal chamber to the vertical chamber. The horizontal chambers are provided near the outlet ends with gas outlets connected with tuyères opening into the lower part of the vertical chamber.—J. S. G. T.

Fuel-gas; Apparatus for the generation from incandescent carbonaceous material of — for use in internal combustion engines. J. W. Parker, Harrow, and E. Goldsmid-Abrahams, London. Eng. Pats. 126,140, 3.5.18, and 126,172, 17.5.18. (Appls. 7435 and 8296/18.)

A gas generator of the vertical or inclined type, through which steam and air are passed, is mounted on hollow trunnions so that it may be brought to a substantially horizontal position, and is provided with a removable fire-grate enabling the clinker and ash to be removed from the generator without risk of extinction of the fire. An ashpan is connected with the fire-grate, and is removable therewith. The air supply to the fire-box is preheated in a jacket surrounding the same, and communicating with the upper end thereof by way of a row of holes in the fire-box wall. A similar row of holes opens from the lower end of the jacket into the space below the fire-grate. A steam supply is derived from small boilers furnished with jets, mounted in the fire-box, or in or on the fire-box wall on its lower side, and movable therewith. The

supply of water to the boilers is controlled by means of float valves. In operation the maximum temperature is attained in about the middle region of the generator, and the fuel gas is withdrawn from this region. In a modification a J-shaped generator, not mounted on trunnions, is used.

—J. S. G. T.

Light mineral oils [turpentine substitute]; Method and apparatus for producing — from petroleum. A. L. Thomsen, Esbjerg, Denmark. Eng. Pat. 126,089, 3.5.18. (Appl. 9906/17.)

A MIXTURE of petroleum (e.g., 100 kilos. of "water white" grade) and an aqueous alkaline solution (e.g., 3 kilos. of soda and 300 kilos. of water) is distilled in a vessel heated to a constant temperature between 95° and 110° C. for 5 to 10 hours, i.e., until about 80% of the petroleum is converted into a light oil. A globular still fitted with a steam jacket on the outside and with an internal steam coil is used, and a direct steam supply to the still is also provided. The refined oil has sp. gr. 0.772–0.790, and may be employed as a turpentine substitute.—L. A. C.

Oil; Apparatus for dehydrating — F. W. McNear, Menlo Park, and P. E. Bowles, jun., Reward, Calif. U.S. Pat. 1,297,378, 18.3.19. Appl. 2,10.16.

OIL is electrically dehydrated in a tank which has a conductive inner surface and is provided with a number of annular electrodes spaced axially and connected to one side of a source of electric energy and also to the conductive surface. Between the annular electrodes is a series of disc electrodes spaced axially from the annular electrodes and connected to the other side of the source of electric energy, leaving a space for the flow of liquid through the successive annular electrodes and round the successive discs. The spaced electrodes of opposite polarity may be arranged closer together at the top than at the bottom of the tank.

—C. A. M.

Emulsion-oils; Treatment of — F. M. Rogers, Assignor to Standard Oil Co., Whiting, Ind. U.S. Pat. 1,299,385, 1.4.19. Appl. 26.1.18.

THE sodium salt of a sulphonic acid produced by sulphonating a mineral oil is added to an emulsion of mineral oil and water (e.g., "bottom settlings") at the rate of $\frac{1}{4}$ to 4 lb. of the salt per barrel of oil, and the mixture is maintained at a raised temperature until it separates into layers.—L. A. C.

Associated liquids [mineral oil emulsions]; Method of separating — Method of and means for separating water from heavy-oil emulsions. C. W. McKibben, Houston, Tex. U.S. Pats. (A) 1,299,589 and (B) 1,299,590, 8.4.19. Appl. 14.12.17 and 24.10.18.

(A) An oil-water emulsion is passed through a relatively long conduit in which it is subjected to the action of a continuous uniform electric field between electrodes within the conduit, the velocity of the emulsion being sufficient to break up the chains of polarised water globules which tend to form between the electrodes. The oil which separates out is led away. (B) A heavy-oil emulsion is heated to vaporising point, and the liquid is then passed continuously through an intensified electric field. The vapours are condensed, the liquids are cooled below the vaporising point, and the water, after settling to the bottom of the vessel, is automatically discharged.—L. A. C.

Motor fuel. C. L. E. Mueller, Joliet, Ill. U.S. Pat. 1,297,388, 18.3.19. Appl., 21.10.18.

A FUEL oil comprises a mixture of anthracene oils dissolved in the light oils derived from the fractional distillation of coal tar, with the products of the distillation of crude petroleum up to 350° C.

—B. N.

Solidified liquid fuel; Infusible — and process of making the same. F. E. Poulton, Boston, Mass., Assignor to S. Sternan and Co., Brooklyn, N.Y. U.S. Pat. 1,290,408, 1.4.19. Appl., 16.4.15.

A SOLID infusible fuel comprises colloidal pyroxylin and alcohol, or alcohol and ether, the pyroxylin being in sufficient quantity to retain the alcohol, under normal conditions of commercial handling and use.—J. S. G. T.

[Mineral oil] stills; Apparatus for removing deposits from —. N. W. Thompson, Oakland, Assignor to Shell Co. of California, San Francisco, Cal. U.S. Pat. 1,298,602, 25.3.19. Appl., 27.8.17.

IN A vertical still the oil under treatment flows down the inner walls and the vapours formed pass away through holes in an axial hollow column. Scraping devices arranged to remove deposits from the inner walls of the still are mounted on the hollow column which is rotated during the distilling operation.—T. St.

Mineral oils; Process of treating —. C. J. Greenstreet, Webster Groves, Mo., Assignor to Gasoline Corporation, New York. U.S. Pat. 1,299,172, 1.4.19. Appl., 31.3.13. Renewed 10.8.18.

HEAVY mineral oil together with steam is run through a continuous unobstructed coil of pipe maintained at 900°–1200° F. (about 480°–650° C.) at such a rate that 52 galls. pass through a pipe 1½ ins. in diameter and 100 ft. long in 6–9 mins. Solid and semi-solid ingredients of the oil are broken down, and the resulting oil, of density about 48° B. (sp. gr. 0.786), and richer in olefines than the untreated oil, is volatile without residue at ordinary temperatures.—L. A. C.

Gasoline; Process of obtaining — from hydrocarbon gases. J. B. Garner, Assignor to Hope Natural Gas Co., Pittsburgh, Pa. U.S. Pat. 1,299,455, 8.4.19. Appl., 18.1.17. Renewed 26.8.18.

HYDROCARBON gases containing gasoline are treated at first under normal pressure, then under a pressure considerably greater than that of the atmosphere, with a solvent capable of dissolving gasoline. The pressure is then reduced somewhat, whereby constituents lighter than gasoline which have been absorbed by the solvent are removed. The gasoline is subsequently recovered from the solvent.—L. A. C.

Paraffin wax; Process and apparatus for purifying crude —. A. L. G. Dehne, Halle. Ger. Pat. 310,850, 17.3.18.

THE paraffin wax left in the filter-press after the removal of the heavy oil is washed out by means of a light oil (benzine or the like), which is preferably cooled to at least 0° C. The filter-press used in the process has special outlet channels for the light oil in addition to those for the heavy oil.

—C. A. M.

Sulpho acids from mineral oils and petroleum distillates; Process of obtaining —. W. Happach, Malmö, Sweden, and Sudfeldt und Co., Melle. Ger. Pat. 310,925, 24.6.13. Addition to Ger. Pat. 264,785/13.

THE products prepared as described in the chief patent by means of fuming sulphuric acid are

washed with water, and the solution containing the sulpho acids is treated with a small quantity of methyl or ethyl alcohol or acetone. The petroleum hydrocarbons separate and form an upper layer whilst the sulphonic acids remain in solution.

—C. A. M.

Pulverulent fuel; Fire-boxes for burning —. E. C. R. Marks, London. From Fuel Saving Co., New York. Eng. Pat. 125,768, 26.4.18. (Appl. 7060/18.)

SEE U.S. Pat. 1,266,088 of 1918; this J., 1918, 404 A.

Distillation gases of coal; Purification of —. E. Ciselet and C. Deguide, Brussels. Eng. Pat. 9780, 5.7.15. Int. Conv., 6.7.14.

SEE Ger. Pat. 297,101 of 1915; this J., 1917, 637.

Hydrocarbon oils; Process for transforming heavy — into lighter hydrocarbon oils. R. Cross, Kansas City, Mo., U.S.A. Eng. Pat. 126,103, 3.4.18. (Appl. 5704/18.)

SEE U.S. Pat. 1,255,138 of 1918; this J., 1918, 200 A.

Liquid-fuel furnace. Eng. Pat. 125,629. See I.

Hydrogen. Eng. Pats. 126,251 and 126,256. See VII.

II.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Reflecting power of tungsten and stellite. W. W. Coblenz and W. B. Emerson. Bull. Bureau of Standards, 1918, 14, 307–316.

IT has already been observed that the curve representing the radiation from incandescent tungsten filaments corresponding to various wave lengths as abscissae, showed elevations in the region 0.8μ–0.9μ. The reflecting power of four samples of tungsten has since been measured in the region of the spectrum from 0.5μ to 6.0μ, employing a mirror spectrometer, fluorite prism, and a vacuum thermopile of bismuth-silver. The reflecting power of the tungsten was determined by comparison with a freshly silvered glass mirror, or, for the region 0.5μ to 1.2μ by comparison with the reflecting power of the hypotenuse face of a right-angled glass prism. The reflecting power curves of all the samples showed a marked depression at 0.8μ, and a similar indentation occurs at 1.3μ in the reflectivity curve of the pure metal, but is absent from that of an impure sample. The reflecting power rises abruptly from 50% at 0.5μ to 90% at 2μ, and thereafter increases gradually to 96% at 6μ. The depression at 0.8μ indicates that selective emission must occur in this region of the spectrum. The reflectivity curves indicate that the luminous efficiency of an alloy of tungsten in which the minimum at 1.3μ is obliterated is higher than that of pure tungsten. The reflectivity of stellite (an alloy of chromium, cobalt, and molybdenum) increases gradually from 65% at 0.6μ to 88% at 9μ.

—J. S. G. T.

PATENTS.

Carbonaceous substances; Treatment [distillation] of —. H. H. Mullner, London, and A. T. Kent, Sutton, Surrey. Eng. Pat. 125,698, 21.3.18. (Appl. 5014/18.)

CARBONACEOUS material, e.g., cannel coal or shale, is subjected to distillation within a vertical retort of the continuous or semi-continuous type, wherein respective temperatures of 500° C. and 200° C. are maintained at the bottom and top. Steam, coal-gas, or water-gas, at low pressure is continuously supplied at the bottom of the retort and passes upwards through the charge.—J. S. G. T.

Vacuum electric discharge apparatus for lighting.
The British Thomson-Houston Co., Ltd., London.
From General Electric Co., Schenectady, N.Y.,
U.S.A. Eng. Pat. 125,201, 6.4.18. (Appl. 5917/18.)

A VACUUM electric discharge apparatus comprises a sealed vessel containing solid elongated metal electrodes, mounted side by side and spaced apart to form discharge gaps. The atmosphere of rare gas of good conductivity, such as neon or helium, is at a pressure of about 1 mm. of mercury, so that a potential of 220 volts will establish and maintain a luminous discharge from the electrodes, consisting almost solely of the negative glow. The electrodes may be mounted concentrically about the longitudinal axis of the bulb, alternate electrodes being of opposite polarity; or the positive electrode may be mounted near the axis of the bulb, with the negative electrode formed from a number of metallic members mounted concentrically with and parallel to the positive electrode; or a central glass hub may be provided with radial arms, and the elongated electrodes mounted on them.—B. N.

Electric [arc] lamps; Fume-absorber for —. W. R. Mott, Lakewood, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,297,387, 18.3.19. Appl., 27.1.17.

THE electrodes of electric arc lamps are adapted to form an arc containing glass-etching fluorides and a fume absorber containing fused boric oxide, the latter combining with the fluorides to form complex borofluorides, or hydrofluoboric acid, which are inactive towards glass.—B. N.

Electric incandescence lamp; Metal filament —.
L. Hamburger, D. Lely, jun., and Naaml. Vennoots. Philips' Gloeilampenfabrieken, Eindhoven, Holland. Ger. Pat. 311,054, 6.1.16.

SEE Eng. Pat. 113,626 of 1916; this J., 1918, 234 A. Instead of calcium fluoride, sodium oxide, sodium phosphate, or sodium tungstate may be used. Prevention of blackening of the bulb is probably due to the formation of a colloidal solution of the vaporised metal at the surface of the salt layer.

Electric incandescence lamps; Carbon filament — filled with gas containing hydrocarbons. C. Schlesinger, Strassburg. Ger. Pat. 311,101, 10.5.17.

THE bulb of a carbon filament lamp is filled with a mixture of nitrogen, argon, or similar indifferent gas, and a hydrocarbon. The useful life of the lamp is about 800 "lighting" hours, and the current consumption is from 40 to 80% of that of the unfilled carbon filament lamp.—J. S. G. T.

Drying process. U.S. Pat. 1,299,791. See I.

III.—TAR AND TAR PRODUCTS.

Tar lubricating oil. K. Bruhn. Stahl u. Eisen, 1919, 39, 402—406, 469—474.

By treatment of the anthracene oil fraction in the distillation of coal tar a good lubricating oil has been produced in Germany during the war period, and it is calculated that 150,000 tons should be available annually. Crude anthracene oil (b.pt. 300°—360° C.) is cooled to a low temperature, filtered, freed from the more volatile constituents, again cooled and filtered, and then treated in various ways to modify its viscosity. Diagrams are given showing the viscosity of a number of samples at different temperatures in comparison with mineral oil. Its setting or solidifying point is below -10° C. It is rather difficult entirely to

remove water, and also to overcome its tendency to deposit sediment at low temperatures, but care in the distillation process has led to a considerably improved product. At ordinary temperatures it is with difficulty miscible with mineral oil, but good admixture is obtained at higher temperatures. It is composed of a mixture of fluid and dissolved solid hydrocarbons of the anthracene and phenanthrene series and their hydro-derivatives, together with complex aromatic nitrogen and oxygen compounds. Methods of sampling are described and transportation and storing are considered. A diagram is given illustrating that the viscosity of a mixture of mineral oil and tar lubricating oil is below the mean of its components. Laboratory and industrial lubrication tests are described. Comparative tests on a railway wagon axle loaded to imitate running conditions showed that the tar lubricating oil maintained as low bearing temperatures as mineral oil. Similar successful results were obtained in a steam engine and an alternator. It has been adopted by a works in Bochum, a large steel works in Rhenish Westphalia, and the State Railways, and is now used for nearly all kinds of lubrication.—T. H. Bu.

Benzol extraction. St. Clair Deville. See IIa.

Toluol recovery. McBride and others. See IIa.

Cracking petroleum. Lidow. See IIa.

PATENTS.

Phenol or its homologues; Separating — from an aqueous liquid. D. Tyrer, Stockton-on-Tees. Eng. Pat. 125,625, 21.9.16. (Appl. 15,423/16.)

WATER containing phenol or its homologues in solution is agitated with nitrobenzene, or a solution of nitrobenzene in a suitable diluent, e.g., 20% of nitrobenzene in a mixture of equal parts of solvent naphtha and crude benzol. The resulting phenol solution is treated with alkali solution for removal of the phenol etc., and the extracting liquid is used again.—B. V. S.

Carbolic acid [phenol]; Method of making —.
H. H. Dow, Assignor to The Dow Chemical Co., Midland, Mich. U.S. Pat. 1,274,394, 6.8.18. Appl., 10.7.16.

SODIUM phenoxide is produced when bromobenzene is heated in closed vessels with a dilute alkali hydroxide solution under a pressure of 20 atmospheres. On acidification phenol of high purity is obtained.—G. F. M.

Benzene-monosulphonic acids; Preparation of —.

Comp. des Produits Chimiques d'Als et de la Camargue, Salindres, France. Eng. Pat. 126,039, 7.11.16. (Appl. 15,960/16.) Int. Conv., 25.2.16. Addition to Eng. Pat. 101,973 (this J., 1917, 705).

BENZENE vapour is passed through a steam superheater on its way to the sulphuric acid, which is kept at a temperature of 160°—200° C. Apparatus is described for both intermittent and continuous working, in the latter case on the counter-current principle.—B. V. S.

Sulphonic acids; Manufacture of aromatic —.

Manufacture of benzene sulphonic acids. J. A. Ambler, Norwich, Conn., and H. D. Gibbs, San Francisco, Cal. U.S. Pats. (A) 1,300,227 and (B) 1,500,228, 8.4.19. Appl., 16.1.18 and 26.1.18. (Dedicated to the public.)

(A) A CONTINUOUS process in which the vapours of the hydrocarbon and of sulphuric acid are allowed to react, any excess of hydrocarbon along with the water formed by the reaction being

removed as vapour and any excess of sulphuric acid along with the sulphonic acid being withdrawn as liquid. (8) The process is particularly applied to benzenesulphonic acids.—B. V. S.

Nitrophenols; Manufacture of —. D. B. Macdonald and J. Calvert. Eng. Pat. 126,062, 24.11.16. (Appl. 16,843/16.)

If in the manufacture of nitrophenols by the interaction of benzene, nitric acid, and mercuric nitrate, the process is carried out in the presence of carbon dioxide, large quantities of 2,4-dinitrophenol are formed. The gas, under a pressure of about 1 atm., may either be passed into a mixture of the three reagents, or first through either the benzene or nitric acid contained in a separate vessel, the mixed vapours being led into the mixture of nitric acid and mercuric nitrate, or benzene, mercuric nitrate, and a portion of the nitric acid respectively. In the examples given 4 grms. of mercury, 90 grms. of nitric acid (sp. gr. 1.42), 40 grms. of benzene, and 22 grms. of carbon dioxide are used, and the reaction is allowed to proceed for 6 hours at 40°–50° C., at the end of which time the dinitrophenol is isolated from the upper layer by the evaporation or steam distillation of the volatile constituents.—G. F. M.

Nitrophenols; Manufacture of —. D. B. Macdonald and J. Calvert. Eng. Pat. 126,084, 4.12.16. (Appl. 17,377/16.)

THE formation of 2,4-dinitrophenol by the interaction of benzene, nitric acid, and mercuric nitrate is facilitated by passing air or oxygen, or mixtures of air and/or oxygen with carbon dioxide, into the reaction mixture in the same manner as that described in Eng. Pat. 126,062 (see preceding abstract).—G. F. M.

N-Methyl-p-aminophenol; Process of manufacturing —. R. N. Harger, Washington, D.C. U.S. Pat. 1,297,685, 18.3.19. Appl., 10.12.18. (Dedicated to the public.)

N-METHYL-P-AMINOPHENOL is prepared by heating together quinol and methylamine at 150° C. for five hours.—G. F. M.

Nitrated coal-tar derivatives; Treating liquor from reducing processes of —. I. Kitsee, Philadelphia, Pa. U.S. Pat. 1,298,513, 25.3.19. Appl., 26.1.18.

LIQUOR which has been used to reduce nitrated coal-tar derivatives is electrolysed, both the metal and the acid being recovered.—B. V. S.

Anthraquinone; Purification of —. H. D. Gibbs, Cherrydale, Va., H. F. Lewis, Urbana, Ill., and The Selden Co., Pittsburgh, Pa., U.S.A. Eng. Pat. 125,836, 5.7.18. (Appl. 11,072/18.)

SEE U.S. Pat. 1,293,610 of 1919; this J., 1919, 280 A.

Motor fuel. U.S. Pat. 1,297,388. See IIa.

Resin from solvent naphtha. U.S. Pat. 1,297,328. See XIII.

IV.—COLOURING MATTERS AND DYES.

Tetrahydronaphthalene; Preparation and properties of derivatives of and dyestuffs from —. F. M. Rowe. J. Soc. Dyers and Col., 1919, 35, 128–134.

AR-TETRAHYDRO- α -NAPHTHYLAMINE, together with a small amount of ac-tetrahydro- α -naphthylamine, is obtained by the action of sodium and amyl alcohol

on α -naphthylamine at the boiling temperature. With ethyl or butyl alcohol no ar-tetrahydro- α -naphthylamine is obtained even in presence of sodium amalgam, mercurous chloride, a nickel catalyst, or dextrose. The process is conveniently carried out by adding a solution of α -naphthylamine in amyl alcohol to boiling solvent naphtha or toluene containing metallic sodium. Under these conditions substitution of butyl or ethyl alcohol for amyl alcohol yields dihydro- α -naphthylamine, large colourless rhombic plates, m.p. 37.5° C., which can be diazotised and coupled with amines and phenols giving azo dyes differing considerably in shade from similar azo dyes derived from α -naphthylamine or ar-tetrahydro- α -naphthylamine. A large number of derivatives of ar-tetrahydro- α -naphthylamine have been prepared and their properties determined, particularly their effect when substituting the corresponding non-hydrogenated derivatives in azo dyes and in the sulphide fusion.—T. C.

PATENTS.

Colouring matter [Indanthrene]; Production of a —. J. Morton, A. G. Dandridge, and Morton Sundour Fabrics, Ltd., Carlisle. Eng. Pat. 126,112, 25.4.18. (Appl. 7009/18.)

N-DIHYDRO-1.2.2'.1'-ANTHRAQUINONEAZINE (Indanthrene) is obtained from 2-aminoanthraquinone and potassium hydroxide in much purer condition and in better yield than is possible by the method described in Eng. Pats. 3239 and 22,762 of 1901 (this J., 1902, 249, 1391) by carrying out the fusion in the presence of potassium chlorate. In the example given 7.5 parts of potassium chlorate is added to 120–200 parts of fused potassium hydroxide, the temperature is allowed to fall to 200° C. and 40 parts of 2-aminoanthraquinone is added. After heating for $\frac{1}{2}$ hour at 250° C., the melt is run into 1000 parts of water, and boiled until the dyestuff is completely precipitated. The substance prepared in this way gives bright blue shades on cotton.—G. F. M.

Picric acid. Eng. Pats. 125,160 and 125,461. See XXII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wool; Cleaning [scouring] of — with volatile solvents. H. Hey. J. Text. Inst., 1919, 10, 118–123.

THE author gives a brief survey of the scouring or cleaning of wool by organic solvents, noting the more important points of practical value. The solvent containing the grease should be evaporated at a low temperature to prevent darkening the grease, this being particularly necessary when the wool and solvent contain water. The finer qualities of raw wool, those generally containing most grease, are more likely to be damaged by ordinary scouring than by solvent extraction. With a modern plant, the grease may be removed to any desired extent, but most of the suint and dirt must be removed by an after-treatment with warm water. The solvent must be removed from the extracted wool before washing, or emulsions, which cause considerable trouble, will be produced; this difficulty has perhaps hindered the solvent scouring process more than anything else. The most modern plant consists of an outer casing of iron for containing the solvents, and an inner cage of steel, with a periphery of perforated steel plates, which is carried on a strong steel shaft. The cage is divided into four compartments, each fitted with

a door, which may be brought opposite to a door in the outer casing. The inner cage is made to revolve slowly when washing and very quickly when centrifuging. The drying arrangements consist of large pipes or ducts leading from the top of the machine through a cooler and centrifugal air-tight fan to a heater, and then to the centre of the machine where the hot gases are distributed through the material. The whole of the operations are carried out in an inert atmosphere, such as carbon dioxide or washed flue gases. The application of solvent scouring to carbonised greasy wool is said to give better results than the carbonising of scoured wool. The raw wool is treated with acid, dried, extracted with solvent, and then the burrs crushed and shaken out. The treated material is then neutralised and washed as usual.

—L. L. L.

Flax; Retting of — by means of bacteria. R. Loeser. Umschau, 1918, 22, 685—686. Chem. Zentr., 1919, 90, II., 283.

In carrying out Rossi's process of retting (this J., 1917, 79), flax was boiled for 40 mins. and then treated with a cultivation of *B. Comesi* (which is closely allied to the butyric acid bacteria) in large vats aerated from below. After fermentation for 36 to 40 hours at 30°—32° C. the flax had only a slight brown colour and was nearly odourless.

—C. A. M.

Vegetable textile fibres; Comparative examination of —. R. Haller. Färber-Zeit., 1919, 30, 29—33, 43—47.

The author gives a fairly full account of the action of certain reagents upon many of the vegetable fibres, and points out the necessity of studying the behaviour of fibres towards reagents when viewed under the ultramicroscope. The production of Prussian blue, by the action of some fibres on ferric chloride and potassium ferricyanide, which Cross and Bevan declared was due to the so-called lignocellulose content of the fibres, has been shown by the author (this J., 1915, 1047) to occur in the case of certain kinds of cotton which do not contain lignocellulose. Kakhi cotton, a variety of *Gossypium hirsutum*, which is grown in Malta, gives an intense blue with ferric chloride and potassium ferricyanide; it also reacts abnormally with ruthenium red with which it gives a deep red colour. The deep blue colour produced by Methylene Blue on jute has been ascribed to the presence of tannin-like substances. Jute, however, does not give a colour reaction with titanium chloride, whereas tannin gives a deep orange colour. Interesting observations were made under the microscope of the action of ammoniacal copper oxide upon fibres, the fibres, in most cases, having been isolated by the Schulze method (nitric acid and potassium chlorate). With isolated jute fibres this action is at first slow; gradually the cells separate, bending sideways, and splitting into two portions. Raw jute, treated in a similar manner, leaves a brown tubular residue, the cellulose passing into solution. The residue no longer gives a blue colour with ferric chloride and potassium ferricyanide; it is not changed by the action of caustic soda, nor is it dyed by Methylene Blue; it gives a blackish colour with zinc chloride and iodine. The isolated hemp fibre on treating with ammoniacal copper oxide leaves a membrane which gives a violet colour with zinc chloride and iodine or a brown colour with sulphuric acid and iodine; it is insoluble in caustic soda, and gives a dark olive-green with ferric chloride and potassium ferricyanide. Linen, examined under the ultramicroscope, turns dull and then almost completely dissolves when treated with ammoniacal copper oxide; nettle fibre, under similar conditions, rapidly turns dull and then

opaque. Bast fibres of the bulrush type have lately found commercial use. The cells of the fibres isolated by the Schulze method often measure 0.7 mm. in length, each end of the cell being pointed. Under the action of ammoniacal copper oxide the raw fibres separate into single cells; these change similarly to cotton. Iodine in sulphuric acid gives a dark blue colour, iodine in zinc chloride a violet, phloroglucinol in hydrochloric acid shows only a very slight lignocellulose reaction, whereas "ruthenium red" gives an intense coloration. The fibres of broom give cells of 5 to 6 mm. in length. The fibres are striped, and the ends of the cells rounded. During treatment with ammoniacal copper oxide, the fibres begin to swell and separate, and the cuticular-like membrane dissolves, the latter being spiral-shaped around the cells. The fibre is free from lignocellulose but gives a reaction with "ruthenium red." Hop fibres appear very similar to hemp fibres; the cells are about 10 mm. long, the ends being very sharp. The isolated fibres (Schulze method) of lupins have cells of 0.8 to 2 mm. length. The ends are both pointed and round; ammoniacal copper oxide attacks the fibre only slowly. Cotton grass (*Eriophorum*) has found little application on account of its brittle nature; it very strongly withstands the action of ammoniacal copper oxide.

The following table gives the reactions of different groups of fibres:—

	Reaction with iodine solution	Reaction with "ruthenium red"	Phloroglucinol test	Maule's reaction	Reaction with $\text{FeCl}_3 + \text{K}_2\text{Fe}(\text{CN})_6$
Cotton	Cellulose reaction	No colour	no colour	—	—
Nettle	"	red colour	"	—	—
Flax					
Broom					
Hemp					
Bulrush					
Lupin	"	"	pale rose	—	—
Cotton-grass (<i>Eriophorum</i>)	yellowish brown colour	—	—	—	pale blue
Kakhi cotton	"	red colour	—	—	+
Jute	"	"	red colour	+	+

The above reactions are those of the raw fibres. With the isolated fibres the reactions would be different; for example the separation may produce oxycellulose and this would give a reaction with "ruthenium red," whereas cellulose does not.

—L. L. L.

Vegetable fibrous raw materials and cellulose prepared from them; Scheme for analytical examination of —. C. G. Schwaibe. Z. angew. Chem., 1919, 32, 125—126. (See this J., 1918, 685 A.)

For the determination of moisture the method of distilling with toluene or petroleum hydrocarbon is recommended, since errors due to volatile oils etc. are thereby avoided and larger quantities of the sample may be employed in the case of materials which are not uniform. In the determination of the fat and resin, the result varies with the solvent employed; in view of accumulated data the usual extraction with ether, followed by alcohol, should be retained. Many materials, including straw and sulphite wood pulp, yield almost double the quantity of fat or resin to organic solvents if they are first subjected to acid hydrolysis. It is suggested that

values should be recorded before and after breaking down the cell structure with acids. The calculation of the methyl value in terms of lignin is not possible on account of the variable constitution of the latter. It is not considered likely that methyl-pentosans would influence the results of the methoxyl estimations, but pectins in materials other than wood may contribute substantially to the methoxyl value, since they yield methyl alcohol on treatment with dilute acids. The methods for the direct estimation of lignin as a residue from the treatment with highly concentrated hydrochloric or sulphuric acids require further investigation and may give useful results. Possibly the determination might be performed with greater accuracy after breaking down the cell structure by acid hydrolysis. As regards the furfural value, since small quantities of furfural are derived from hexoses apart from pentosans, it is preferable not to calculate in terms of pentosans. As a rule, especially in the case of unknown materials, the methylfurfural value should be expressed separately from the furfural value. The cellulose should be determined by Cross and Bevan's method with a correction for the furfural value of the product; König's proposal for a preliminary hydrolysis of the material does not afford sufficiently precise data, owing to the attack on the cellulose itself. The "acetic acid value" as described by Schorger (this J., 1917, 867) would appear to be a valuable factor in the characterisation of fibrous materials. The nitrogen content may also play an important part in the characterisation of vegetable fibres other than wood and in the determination of the purity of celluloses derived from them. In the examination of celluloses the estimation of the "copper value" is an accepted standard method, which is used to express the degree of bleaching of the cellulose. The quantity of cupric hydroxide adsorbed by the cellulose from cold Fehling's solution has been called the "hydrate copper value"; more recently, the term "degree of swelling" has been preferred. The "wood gum" value is a complex expression used for indicating the portions of the cellulose and its impurities which are soluble in strong sodium hydroxide. This estimation is preferably replaced by a determination of the α , β , and γ -cellulose fractions, according to the method of Cross and Bevan.—J. F. B.

Flax and hemp sprits; Chemical composition of — C. G. Schwalbe and E. Becker. Z. angew. Chem., 1919, 32, 126—129.

The scutching wastes, consisting mainly of particles of flax and hemp woods ("sprit" or "sheave"), were analysed according to Schwalbe's scheme (see preceding abstract). The ash was free from manganese. The fat and wax were estimated in two ways with different results, viz., by extraction with ether, followed by alcohol, and by extraction with a mixture of equal volumes of alcohol and benzene. It would appear that alcohol alone is capable of extracting certain substances other than fat, wax, and resin. In both materials the cholesterol test for resin was positive. Attempts to estimate the lignin according to König's method by dissolving out the cellulose with sulphuric acid did not give very reliable results. The following method with preliminary disintegration of the structure by hydrolysis gave concordant values, but too great reliance should not be placed on their interpretation: 1 grm. of substance was moistened with strong hydrochloric acid (sp. gr. 1.19) in a stoppered bottle and heated for some time; the stopper was then removed and the material in the bottle dried on the water bath. The hydrolysed product was collected on an asbestos filter, washed, and the material, together with the asbestos, was digested with 50 c.c. of 72% sul-

phuric acid at the ordinary temperature for 1–2 days. The residue was collected in a Gooch crucible, dried, weighed, ignited, and the lignin calculated by difference. Pectin was estimated by von Fellenberg's method (this J., 1917, 1190) by means of the methyl alcohol produced on heating with dilute acids. Pentosans were estimated from the furfural value according to Tollens and Kröber, the phloroglucide precipitate being afterwards extracted with alcohol to give the methylfurfural value, the results of which, however, were somewhat variable. Cellulose was estimated by Sieber and Walther's modification of Cross and Bevan's method (this J., 1913, 974), and since the cellulose retained the greater portion of the pentosans, these were deducted from the cellulose results. A substantial amount of acetic acid was formed on distillation with dilute sulphuric acid according to Schorger's method. The analytical results are summarised in the table below, together with the values of spruce wood for comparison. It is to be noted, however, that the woody portions of flax and hemp show a closer similarity to the dicotyledonous woods than to coniferous woods, particularly as regards their high content of pentosans and the substantial yield of acetic acid. The sum of the proximate constituents calculated from the analytical results amounts to considerably over 100% and the authors propose to reject the direct lignin values, substituting for them the average value of 20–21% which has been established for the wood of foliage trees.

	Calculated on dry substance		
	Flax sprit	Hemp sprit	Spruce wood
Ash ..	1.40	1.20	1.00
Wax (a) Ether extract ..	1.38	1.20	0.6
Fat (b) Alcohol extract ..	1.31	1.95	0.38
and (c) Sum of (a) and (b)	2.69	3.15	0.98
Resin (d) Alcohol-benzene extract ..	2.34	2.23	—
Methyl value ..	2.68	2.55	2.33
Pectin (according to von Fellenberg)	2.68	0.98	0.14
Acetic acid (Schorger's method)	4.79	4.04	1.6
Protein, N×6.25 ..	2.70	2.85	1.2
Furfural ..	13.81	13.03	—
Pentosan ..	23.59	22.15	11
Methylpentosan ..	0.47	0.51	—
Cellulose containing pentosan corrected for pen- tosan ..	62.99	71.13	60
Lignin (residue from 72% sul- phuric acid) ..	46.35	50.52	53
	23.77	30.12	30

—J. F. B.

Gas mask fabrics; Effect of exposure to weather on rubber — G. St. J. Perrott and A. E. Plumb. J. Ind. Eng. Chem., 1919, 41, 438—443.

FABRICS of different manufacture and consisting of finely-woven cotton sheeting covered with a rubber layer from 0.01 to 0.025 in. thick, deteriorated very slowly over a period of 100 days. There was a general relation between the amount of acetone extract and the permeability, and deterioration was more rapid in the summer months than in winter. Fabrics exposed rubber side downwards showed no appreciable deterioration over the whole period: those exposed rubber side upwards, but shielded from ultra-violet light, deteriorated at about the same rate as those exposed to the direct rays of the sun. There was no apparent relation between the results of weather ageing and an accelerated ageing test at 130° C. The tensile strength of all the fabrics decreased by 15% during the exposure. Both the fabric and rubber rotted when exposed to high concentrations of phosgene for 15 hrs. Analysis of the fabrics indicated that over 10% of bitumen

was undesirable and that as high as 20% of carbon tended to preserve the fabric, especially when exposed to direct sunlight. Fabrics with a high percentage of gum (rubber) were more resistant than those containing a large amount of filler.

—W. P. S.

Mercury vapour lamps; Use of — for testing fabrics, films, etc. M. Entat. Ann. Chim. Analyt., 1919, 1, 142—153.

A silica mercury vapour lamp is useful for determining the effect of ultra-violet rays on fabrics, rubber-proofed fabric, cellulose acetate sheets and films, etc. The effective area covered by the ultra-violet rays may be determined photographically and the exposure of the fabric is entirely under control. From 2 to 4 hrs. exposure to the rays corresponds with the effect of exposure to sunlight for 30 days; the effects are analogous and can be determined by the usual physical tests.—W. P. S.

Sulphite-cellulose. Yocum and Nelson. See XV.

PATENTS.

Coated fabrics; Impregnated and —. W. H. Perkin, Oxford, J. H. Mandelberg, and J. Mandelberg and Co., Ltd., Manchester. Eng. Pat. 125,622, 20.9.16. (Appl. 13,354/16.)

THE production of impregnated or coated fabrics with compositions containing rubber, litharge, and sulphur, alone, or in some cases along with other substances (see Eng. Pat. 124,495; this J., 1919, 357 A), gives a highly inflammable coating; these coatings are rendered non-inflammable by the addition of hydrated aluminium oxide or asbestos, or a mixture of these ingredients.—L. L. L.

Animal offal; Process of obtaining a waterproof material with properties similar to those of raw silk fabrics from —. F. Schmidt, Würzburg. Ger. Pat. 310,430, 16.8.17.

ANIMAL offal, e.g. ox-gullet, is dried, immersed for 3 to 8 days in 35% formaldehyde solution at 15° C., thoroughly washed, and again dried.—C. A. M.

Willow bark; Process of obtaining white —. H. Oexmann, Berlin. Ger. Pat. 310,545, 15.11.16.

WILLOW bark is treated with alkalis to neutralise the tannic acid. By using more alkali a part of the bark is dissolved, enabling the fibres to be separated in the usual way.—C. A. M.

Waste liquors containing paper pulp and alkaline substances; Clarification of —. H. Höfer, Sillein, Hungary. Ger. Pat. 309,406, 18.11.16.

THE liquor is treated with zinc salts, especially zinc sulphate, which reacts with the alkaline substances present (resin size, calcium hydroxide, etc.) to form a precipitate which carries down with it the suspended paper pulp. The clarifying effect of zinc salts is better than that of the aluminium compounds commonly employed. The zinc salts may be partly replaced by magnesium salts.

Sulphite-cellulose waste liquors; Purification of —. H. Achenbach, Nussdorf. Ger. Pat. 309,563, 20.4.18. Addition to Ger. Pat. 306,898 (this J., 1918, 764 A).

THE process described in the chief patent is applied to sulphite-cellulose waste liquors which have received a preliminary chemical or other treatment. The treatment with flue-gases is repeated several times, and air is excluded during the process.

Fire-extinguisher [from sulphite-cellulose waste lyes]. L. Elkan Erben G.m.b.H., Charlottenburg. Ger. Pat. 310,890, 10.5.17.

SULPHITE-CELLULOSE waste liquor is used as a fire-extinguisher or as a constituent thereof. A dry fire-extinguisher may be produced by mixing concentrated sulphite waste liquor with powdered material.—J. S. G. T.

Artificial thread; Funnels or thread-guides for use in the manufacture of —. E. Dubot, Bagnolet, France. Eng. Pat. 126,263, 23.1.19. (Appl. 2129/19.)

Hydrolysis of esters. Eng. Pat. 125,153. See XII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching with hypochlorites containing free acid or free alkali, and water from different supplies. M. Freiburger. Färber-Zeit., 1919, 30, 89—94.

DIFFERENT solutions of bleaching powder were prepared and analysed. These solutions were then used to bleach both thin and thick materials produced from Egyptian and other cottons. The results are shown in the following table.

	Active Cl, gms. per litre	HClO, gms. per litre	Ratio of free to combined HClO	Result		Cellulose number (Schwalbe)	Corrected copper number (Schwalbe)	Methylene Blue colour %
				thick material	thin material			
1	1.0	0.1508	1:10	worst	good	—	—	0.036
2	1.2	0.208	1:8.8	medium	worse than 3	0.25	0.22	0.043
3	1.2	0.1	1:17.8	best	good	0.25	0.23	0.043

Nos. 1 and 3 were made with distilled water, No. 2 with spring water containing iron and manganese. The bleaching was carried out at 37° C. with 35 minutes' immersion; the pieces were then washed with distilled water, soured, washed, and dried. A second set of experiments was made using sodium and calcium hypochlorite solutions and mixtures of these; they all contained 0.8 gm. of active Cl per litre. Results are shown in the table.

	Hypo- chlorite	Excess per litre	Thin material		Thick material	
			White	Methylene Blue colour	White	Methylene Blue colour
4	Na	0.15 g. Na ₂ CO ₃	7 > 6	0.042	7 > 6	0.035
5	Na	0.033 g. "	5 < 6	0.042	5 > 6	0.028
6	80% Na 20% Ca	0.0052 g. HClO	6 < 7	0.036	6 < 7	0.029
7	50% Na 50% Ca	0.016 g. HClO	7 < 8	0.034	7 < 8	0.03
8	Ca	0.036 g. HClO	best	0.032	best	0.033

Experiments on the influence of different amounts of sodium carbonate on the bleaching effect showed that up to a certain limit excess of sodium carbonate is beneficial. Under the experimental conditions increase of the free sodium carbonate beyond 2 grms. per litre reduced the bleaching effect. The method of bleaching with warm hypochlorite solutions containing both calcium and sodium hypochlorite has been used commercially for some time; it gives better results than the cold bleaching and, when dilute solutions are used, does not damage the cellulose. With bleaching powder solutions the

best results are obtained in an acid solution (HClO), while with sodium hypochlorite the solution should be slightly alkaline. The author considers that the electrolytic bleach should be better than alkali hypochlorite solutions prepared from bleaching powder on account of the varying amounts of sodium carbonate present in the latter, whereas the electrolytic bleach if properly made should have a constant alkali content. (See also this J., 1919, 358 A.)—L. L. L.

PATENTS.

Bleaching process. G. Ornstein, New York, Assignor to Electro Bleaching Gas Co. U.S. Pats. (A) 1,298,552, (B) 1,298,553, and (C) 1,298,554, 25.3.19. Appl., (A, B) 2.12.16, (C) 4.12.16. Renewed 15.2.19.

(A) BLEACHING is effected with a solution of chlorine in water containing not more than about 0.01% of chlorine. The chlorine is said to be hydrolysed, with formation of hypochlorous acid, all of which is present in the free state. (B) Chlorine is passed into sufficient water to convert it completely into hypochlorous acid and hydrochloric acid, the hydrochloric acid formed being neutralised by addition of the necessary amount of a basic material, which will combine with hydrochloric acid but not with hypochlorous acid. The material to be bleached is treated with the solution at or soon after the time of its preparation. (C) Sodium carbonate in proportion required for formation of sodium chloride and bicarbonate is used as basic substance in the process described under (B).—L. L. L.

Dyeing and like apparatus; Perforated beam for — T. Brandwood, Walshaw. U.S. Pat. 1,298,287, 25.3.19. Appl., 19.7.17.

SEE Eng. Pat. 103,772 of 1916; this J., 1917, 335.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; Oxidation of — [to nitric acid]. W. S. Landis. Chem. and Met. Eng., 1919, 20, 470—477.

AN account of the development of the commercial oxidation of ammonia to nitric acid in Germany is given up to the beginning of 1915, followed by a description of the progress made in the industry in America since the beginning of 1916. The catalyst used is platinum gauze of rather less than 2½ oz. per square foot. The ammonia is obtained from cyanamide and it has been found that, once activated, the catalyst will work quite regularly for as long as two years without special purification of the ammonia. A peculiar feature is that on changing from cyanamide-ammonia to specially purified ammonia or coke oven ammonia a new period of as much as ten days is required for re-activation of the catalyst before the former efficiency is restored. The best rate of working seems to be about 5½–6 lb. of ammonia per square foot of catalyst per hour. The Government plant at Muscle Shoals, Ala., has 700 catalysers capable of a normal production of 250 tons of equivalent 100% nitric acid per day with an efficiency from cyanamide to acid of 87% and from ammonia to acid of practically 90%. Where ammonia can be obtained of suitable quality at the price of equivalent nitrogen in sodium nitrate the catalytic process is as cheap as the nitre pot process. The consumption of power on the Government plant for electrical heating of the catalyst was less than 1.7 kilowatt hour per lb. of nitric acid.—W. H. P.

Platinum gauze used as catalyst for the oxidation of ammonia; Data on — Table of weights and active surface of platinum, air space, etc., shown for unit of one square inch of gauze of given mesh and diameter of wire. A. A. Campbell. J. Ind. Eng. Chem., 1919, 11, 468—469.

THE data recorded are given in the following table:—

Mesh	Diam. of wire, In.	Wt. per sq. in. Grm.	Air space persq.in. of gauze, Sq. in.	Surface persq.in. of gauze, Sq. in.	Surface per grm. of platinum, Sq. in.
80	0.0026	0.33815	0.6272	1.3873	4.148
80	0.0030	0.46592	0.5774	1.5841	3.401
100	0.0026	0.42268	0.5676	1.6951	4.013
120	0.0020	0.29863	0.5715	1.4748	4.962
150	0.0015	0.21609	0.5990	1.4821	7.053
150	0.0020	0.37392	0.4886	1.9573	5.243

An alloy consisting of platinum, 99, and iridium, 1%, is as efficient as pure platinum and has the mechanical advantage that a finer wire may be drawn.—W. P. S.

Hypochlorous acid and chlorine monoxide. S. Goldschmidt. Ber., 1919, 52, 753—761.

AQUEOUS solutions of hypochlorous acid, containing 25% of the acid, are readily obtained by distilling a mixture of chlorine hydrate and yellow mercuric oxide in a good vacuum; attempts to prepare a more concentrated solution or the anhydrous acid by distillation of this acid in a moderate vacuum and condensation of the distillate in receivers maintained at 0° C., -20° C., and -80° C., respectively, led to an unexpected result, since aqueous hypochlorous acid (25%) was collected in the first two vessels, whilst pure chlorine monoxide was condensed in the third vessel. It therefore appeared that the aqueous acid contains two equilibrium systems (1) $\text{HClO} \rightleftharpoons \text{H}^+ + \text{OCl}^-$ and (2) $2\text{HClO} \rightleftharpoons \text{H}_2\text{O} + \text{Cl}_2\text{O}$. The latter system has been investigated by determining the partition coefficient of chlorine monoxide between the solution and carbon tetrachloride. The equilibrium lies greatly in favour of hypochlorous acid so that an approximately N/5 solution contains only 0.02% of the anhydride. It is suggested that the well-known superior oxidising power of hypochlorous acid in acid as compared with alkaline solution is due to free chlorine monoxide.—H. W.

Arsenic acid; Gravimetric determination of — L. W. Winkler. Z. angew. Chem., 1919, 32, 122—124.

ARSENIC acid may be determined as arsenic sulphide after reduction with potassium thiocyanate. The solution, containing 0.01–0.15 grm. As_2O_5 , is treated with 10 c.c. of hydrochloric acid and 5 c.c. of 20% potassium thiocyanate solution; hydrogen sulphide is then passed through the mixture for 1 hr., and, after about 18 hrs., the precipitate of arsenic trisulphide and sulphur is collected, washed, dried at 100° C., and weighed. $\text{As}_2\text{O}_5 + 2\text{KSCN} = 2\text{KOCS} + \text{As}_2\text{O}_3 + \text{S}_2$; $\text{As}_2\text{O}_3 + 3\text{H}_2\text{S} = \text{As}_2\text{S}_3 + 3\text{H}_2\text{O}$. If desired, the arsenic trisulphide may be dissolved in ammonia, oxidised with hydrogen peroxide, and precipitated as ammonium magnesium arsenate, and weighed as such or after ignition to magnesium pyroarsenate. When arsenic acid is precipitated directly as magnesium ammonium arsenate, the solution, measuring about 100 c.c., is treated with 25 grms. of ammonium chloride, and 10 c.c. of magnesium sulphate reagent (magnesium sulphate, 10, ammonium chloride, 5 grms., water, to 100 c.c.) is added slowly; after standing overnight, the pre-

pitrite is collected, washed, dried, and weighed, or ignited to magnesium pyroarsenate before being weighed.—W. P. S.

Boric acid; Determination of —. P. Jannasch and F. Noll. *J. prakt. Chem.*, 1919, 99, 1–33.

The authors recommend the use of an alcoholic solution of sodium ethoxide for the titration of boric acid solutions; glycerol is added to prevent dissociation. To determine boric acid in minerals a portion of the sample is fused with sodium phosphate and metaphosphoric acid and the melt distilled with the addition of phosphoric acid and methyl alcohol; the distillate is treated with a definite volume of sodium hydroxide solution, evaporated to expel all methyl alcohol, then treated with a quantity of hydrochloric acid equivalent to the alkali added, the solution boiled to expel carbon dioxide, and the boric acid titrated as described.

—W. P. S.

Nelson electrolytic chlorine cell. C. F. Carrier, jun. *Amer. Electrochem. Soc.*, Apr., 1919. (Advance copy.) 11 pages.

A history is given of the commercial development of the Nelson cell, which was used for the U.S. Government plant at Edgwood, Baltimore, the largest single chlorine plant in the world. 3500 cells were used to give 160 tons of gas per 24 hours. The cell is described in U.S. Pat. 1,149,210 of 1915 (this J., 1915, 969). It is of $\frac{1}{4}$ in. steel plate, with U-shaped cathode plate of perforated sheet steel supporting an asbestos diaphragm, and anodes of graphite $4 \times 4 \times 17$ in. held by lugs $2\frac{1}{2}$ in. diam. and 12 in. long. The top of the cell is made of slate slabs. The diaphragm has to be renewed once in six or eight months. The cells are operated at 1000 amperes, and the commercial guarantee specifies an output of 60 lb. of chlorine and 68 lb. of sodium hydroxide from 120 lb. of salt in 24 hours. The cell can be shut down as desired for short or long periods without damage, and does not require much floor space. A new process of treating the anodes has been perfected which increases the life of the electrode to over two years.—W. H. P.

Sodium hydrosulphite; Chemical decomposition and electrolytic formation of —. K. and E. Jellinek. *Z. physik. Chem.*, 1919, 93, 325–367.

In aqueous solutions and in solutions of sodium bisulphite, sodium hydrosulphite is decomposed according to the equations, $2\text{Na}_2\text{S}_2\text{O}_4 = \text{Na}_2\text{S}_2\text{O}_5 + \text{Na}_2\text{S}_2\text{O}_3$; $\text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O} = 2\text{NaHSO}_3$. The reaction is dimolecular; the reaction constant is proportional to the square of the bisulphite concentration, and increases normally with temperature. The electrolysis of sodium hydrosulphite has been investigated, particularly in respect of those factors which influence the hydrosulphite formation. Solutions containing 7%–8% of hydrosulphite were obtained, but this constitutes a very poor current yield. The poor yield is due to decomposition of the hydrosulphite by local acidity produced at the point where sulphur dioxide is led into the cathode liquid; to electrolytic reduction of hydrosulphite to thiosulphate, and to the fact that the current is partly transported by $\text{S}_2\text{O}_4^{2-}$ ions, which thus pass to the anode compartment and are lost. The loss occasioned by the migration of $\text{S}_2\text{O}_4^{2-}$ ions can be entirely avoided by the insertion of a concentrated solution of sodium chloride between the anode and cathode cells; the Cl^- ions then carry the current instead of the $\text{S}_2\text{O}_4^{2-}$ ions. The loss due to local acidity may be avoided by leading the sulphur dioxide into the solution in very fine streams and in several places. Electrolytic reduction is avoided by choosing electrodes of a metal which positively catalyses the hydrosulphite formation and negatively catalyses the reduction to thiosulphate. Some varieties of lead appear to have this influence.—J. F. S.

Sodium permanganate; Electrolytic process for production of — from ferromanganese. R. E. Wilson and W. G. Horsch. *Amer. Electrochem. Soc.*, Apr., 1919. (Advance copy.) 14 pages.

The necessity of providing pure and cheap sodium permanganate for use in the canisters of box respirators led the authors to investigate the possibility of making this substance electrolytically. The only widely available anode material is ferromanganese, which on account of its great brittleness is very difficult to cast. Suitable anodes have however been obtained by casting in long bars, adding certain deoxidisers, and cooling slowly in kieselguhr. The only catholyte suitable is sodium hydroxide and it is desirable that this should be used in a solution of maximum conductivity (about 18% NaOH). The best anolyte is a 12.14% solution of sodium carbonate, which must be kept cool either by a coil within the cell or by circulating the liquid outside the cell. The anodes gradually accumulate a skin of oxides of iron, manganese, and silicon which cannot be avoided by the use of addition agents, and must therefore be removed every 24 hours by sand-blasting. On a "semi-plant" scale the best material for the cells was found to be sheet iron with diaphragms of asbestos paper supported on iron strips. The end walls of the cells act as cathodes. The best temperature is about 20°C ., and the best current density about 7 amp. per sq. dm. It is not economical to carry the process beyond the production of an 8% solution of sodium manganate, but this can be concentrated to 30%, in which form the cost of sodium permanganate under war conditions is estimated at 60 cents per lb.—W. H. P.

Boronatrocalcite; Treatment of —. E. Longobardi and N. Camus. *Anal. Soc. Quím. Argentina*, 1919, 7, 12–21.

The following process was devised by the authors for the treatment of an impure boronatrocalcite occurring in the Andes territory of the Argentine. The powdered mineral is added in small quantities, alternately with small quantities of sulphuric acid (90%), to 4–5 times its weight of hot water contained in a lead-lined tank provided with efficient mechanical agitation. The amount of acid used is just sufficient to saturate the calcium and sodium oxides present in the mineral, leaving not more than 0.1–0.25% excess of free acid, and the temperature is maintained at $80^\circ\text{--}90^\circ\text{C}$. After passing through a filter-press the clear hot liquor is allowed to crystallise, the mother liquor being used again in the acid treatment tank. The crystals of boric acid are washed with cold water on a filter bed of perforated lead or earthenware and redissolved in hot water so as to give a solution of sp. gr. 1.04–1.05 at 90°C . The solution is acidulated with sulphuric acid to 0.05%–0.1% strength. The boric acid crystallises in prisms. In order to obtain the acid in scale form the sp. gr. of the crystallising solution must not exceed 1.01 at 90°C . The crystals are dried in a centrifuge. A perfectly white product is obtained if all operations are carried out in lead or earthenware vessels. Contact with iron or wood must be avoided.—W. S. M.

Hydrogen sulphide; Modification in the technique of Fischer's reaction for —. L. P. J. Palet and A. Fernandez. *Anal. Soc. Quím. Argentina*, 1918, 6, 49–51.

To a drop of dimethylaniline are added 2 c.c. of water, 3–4 drops of 1% solution of sodium nitrite, and 5 drops of 10% hydrochloric acid. The mixture is neutralised with saturated sodium carbonate solution and the free base extracted with ether. The ethereal solution is decanted and reduced with zinc powder and a few drops of concentrated hydro-

chloric acid. When the green colour disappears the ether layer is rejected. 2 c.c. of water and the solution to be tested are added, then concentrated hydrochloric acid and a few drops of 10% ferric chloride solution. The methylene blue formed is rendered more distinct by adding alcohol. Excess of hydrochloric acid must always be present.

—W. S. M.

Sulphur-oxygen compounds; Method for the identification of —. A. Sander. Chem.-Zeit., 1919, 43, 173.

The following reactions are obtained when the sodium salts named are treated with an excess of mercuric chloride solution:—

Compound	Reaction in the cold	Reaction towards methyl orange	Behaviour of mixture when boiled	Reaction after boiling
Sulphate ..	No ppt.	Remains neutral	No change	Neutl.
Sulphite ..	No ppt.	Remains alkaline	Ppt.	Acid
Bisulphite ..	No ppt.	Becomes acid	Ppt.	Acid
Sulphide ..	Ppt.	Remains neutral	No change	Neutl.
Thiosulphate	Ppt.	Becomes acid	No change	Acid
Polythionate	Ppt.	Becomes acid	No change	Acid

Thiosulphate solutions decolorise iodine solution and give a precipitate of sulphur when acidified; polythionate solutions remain clear when acidified and do not decolorise iodine solution. Sulphites and polythionates cannot exist together in the same solution. (See also J. Chem. Soc., 1919, ii., 241.)

—W. P. S.

Ferric oxides; Hydrated —. E. Posnjak and H. E. Merwin. Amer. J. Sci., 1919, 47, 311–348.

THERE is only one naturally occurring hydrate of ferric oxide, namely the monohydrate; this occurs in two crystalline forms, goethite and lepidocrocite, and one amorphous form, limonite. The mineral turgite is probably a solution of goethite in hematite with adsorbed water. Attempts to prepare crystalline hydrates of ferric oxide were unsuccessful. There are two amorphous hydrates of ferric oxide, one a yellow substance which is essentially the monohydrate, and the other a reddish-brown substance which holds its water in the dissolved or adsorbed condition. (See also J. Chem. Soc., 1919, ii., 235.)—J. F. S.

Silicon tetrachloride. O. Hutchins. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 12 pages.

SILICON tetrachloride can be made practically continuously on the large scale by the action of dry chlorine on carborundum at about 1200° C. The electric furnace used is of firebrick (6 in. thick) with a sheet iron shell. The cylindrical reaction chamber (3 ft. by 1 ft.) has an axial resistor of 1½ in. carbon rod for preliminary heating. The top of the cylinder has an outlet for the tetrachloride and a charging hole for carborundum. The bottom has a narrow inlet for the chlorine. Discharge of the residue takes place from a 6 in. horizontal tube near the bottom of the furnace. Such a furnace produces 20–30 lb. of silicon tetrachloride per hour, and requires recharging about every four hours. For heating the charge power is supplied at 125 volts, the consumption being 15 kilowatts, but when the reaction is in progress no heating is necessary. Condensation of the product requires some care, and a trap is necessary for iron and aluminium chlorides produced from impurities in the carborundum. The tetrachloride is useful for producing smoke clouds, but no extensive non-military use has yet been found for it.

—W. H. P.

Silicon and titanium tetrachlorides; Role played by — during the past war. G. A. Richter. Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 9 pages.

A STUDY of the efficiency of the two chlorides as smoke producers for military purposes. Neither was used extensively except with other materials, especially liquid ammonia. Although titanium chloride gives a cloud of greater obscuring power the overall efficiency of silicon chloride is usually quite as great, since the slowness of evaporation of titanium chloride gives rise to disadvantages such as gumming of nozzles etc.—W. H. P.

Nitrides of nickel and cobalt; Normal —. A. C. Vournasos. Comptes rend., 1919, 168, 889–891.

NICKEL nitride, Ni₃N₂, is readily obtained if a mixture of anhydrous nickelous oxide and anhydrous nickel cyanide in the proportion of 1:0.74 is dropped, in small quantities at a time, through an arc between two carbon electrodes in an atmosphere of nitrogen, providing the temperature of the arc is near 2000° C. The nitride so obtained burns in oxygen, is decomposed when heated in chlorine, and is attacked by nitric and hydrochloric acids. It is not decomposed by boiling water, but molten sodium hydroxide decomposes it with the evolution of ammonia. Cobalt nitride, Co₃N₂, may be similarly prepared and has similar properties.

—W. G.

Cerium nitride. P. Fabaron. Ann. Chim. Analyt., 1919, 1, 156.

WHEN metallic cerium is heated to redness in a closed copper tube, the oxygen of the air in the tube combines with the copper, whilst 20% of the nitrogen combines with the cerium to form cerium nitride, CeN₂; this is a grey-black substance, which decomposes water with the formation of ammonia and cerous oxide.—W. P. S.

Carbon monoxide, carbon dioxide, carbon oxysulphide and similar gaseous mixtures; Analysis of mixtures of vapours containing —. A. Stock and P. Seelig. Ber., 1919, 52, 672–680.

THE methods adopted depend on the differing readiness with which the components of the mixture are absorbed. Two procedures are described. In the first, all constituents are estimated in a single sample. A measured volume of the mixture is shaken with sodium hydroxide (30%, 1 c.c.) and the volume observed each minute during several minutes to determine the carbon dioxide. The solution is then diluted with water (4 c.c.) thus yielding an approximately 5% solution which absorbs carbon oxysulphide fairly rapidly. The mixture is occasionally shaken, and the volume read off after 10, 20, 30, 40, and 60 minutes to determine the carbon oxysulphide. To determine carbon bisulphide, potassium hydroxide solution (30%, 1 c.c.) is added and the volume of gas determined after 1, 2, 3, etc. days. The residue is carbon monoxide which must be completely absorbed by cuprous chloride solution. The second method is more rapid and accurate, but requires more material. A known volume of the sample is shaken with aqueous sodium hydroxide (30%, 1–2 c.c.) and the volume measured at minute intervals to determine the carbon dioxide. A second sample is shaken with sodium hydroxide solution (50%, 2–3 c.c.) at intervals during 15–30 minutes and then continuously until the volume becomes constant. This gives the carbon dioxide plus carbon oxysulphide; carbon bisulphide is practically not absorbed. In a third sample carbon oxysulphide, carbon dioxide, and carbon bisulphide are determined together by

agitating occasionally with potassium hydroxide solution (5%, 2–3% c.c.) and measuring the volume at intervals during 3–4 days. The residual carbon monoxide is tested for purity by ammoniacal cuprous chloride solution. Alternatively, the carbon bisulphide may be estimated as follows: the residue from the determination of carbon dioxide and carbon oxysulphide is immediately treated with a few drops of carbon bisulphide and the increase in volume caused by saturation with carbon bisulphide vapour is determined. The methods have been tested with artificial mixtures of widely varying composition and found to give satisfactory results. The paper also contains vapour tension-temperature tables for aqueous sodium hydroxide solutions between 5% and 50% and between 10° C. and 25° C. and for carbon bisulphide between –80° C. and +30° C.—H. W.

Carbon oxysulphide; Thermal decomposition of — A. Stock, P. Seelig, and W. Ottmann, Ber., 1919, 52, 681–694.

The thermal decomposition of carbon oxysulphide leads to the formation of carbon monoxide and sulphur on the one hand and of carbon dioxide and carbon bisulphide on the other: (i) $2\text{COS} \rightleftharpoons 2\text{CO} + \text{S}_2$ and (ii) $2\text{COS} \rightleftharpoons \text{CO}_2 + \text{CS}_2$. The equilibria have been investigated by passing the gas through an electrically heated quartz tube, condensing the sulphur in a small U-tube maintained at 130° C. and analysing the gases by the methods described in the preceding abstract. At 800° C., reaction (ii) proceeds very slowly whilst (i) is very rapid; carbon oxysulphide is decomposed at atmospheric pressure to the extent of about 64%. At 950° C. the degree of dissociation is at least 76%. Preliminary experiments on the action of heat on carbon dioxide and bisulphide on the one hand and of carbon monoxide and sulphur on the other hand show that the same products are formed as when carbon oxysulphide is heated and that a true case of equilibrium is presented. Similarly, the combustion of carbon bisulphide with an insufficiency of oxygen or of oxygen in carbon bisulphide vapour yields a mixture of unchanged carbon bisulphide, carbon dioxide, sulphur dioxide, carbon oxysulphide, and carbon monoxide. (See also J. Chem. Soc., 1919, ii., 230.)—H. W.

Silicon hydrides. VI. Chlorination and methylation of monosilane. A Stock and C. Somieski, Ber., 1919, 52, 695–724.

In the presence of aluminium chloride, monosilane reacts with hydrogen chloride in much the same manner as with hydrogen bromide (this J., 1918, 578A) yielding monochlorosilane, SiH_3Cl , and dichlorosilane, SiH_2Cl_2 . The former has m.pt. –118° C., b.pt. –30.5° C., sp. gr. at –113° C. (as liquid) 1.145, and is converted by gaseous zinc methyl into methylmonosilane, $\text{SiH}_3(\text{CH}_3)$, b.pt. –5° C., m.pt. –150.5° C., which is scarcely attacked by water in the absence of alkali, but which is slowly decomposed by alkali in accordance with the equation: $\text{SiH}_3(\text{CH}_3) + 2\text{H}_2\text{O} = [\text{SiO}(\text{OH})(\text{CH}_3)]_x + 3\text{H}_2$. Dichloromonomosilane has m.pt. –122° C., b.pt. +8.5° C., and is particularly sensitive to moisture and fat. (See also J. Chem. Soc., 1919, i., 260.)—H. W.

Oxygen; Preparation of — from air. R. C. A. Buntfield, Schweiz. Chem.-Zeit., 1919, 1, 9–18.

A PRELIMINARY cooling of the compressed air in the preparation of oxygen is useful, but not indispensable, but Linde's rectifying plant is now always provided with refrigerating machines. Preliminary

cooling shortens the initial period before the production of liquid oxygen, enables a lower pressure to be used, and by condensing part of the moisture in the air in the refrigerating machine increases the duration of working. The power required ranges from about 2.4 h.p. per hour for the production of 1 cb. m. (=1 unit) of oxygen per hour in small plants to 1.8 h.p. per hour per unit of oxygen in the case of larger plants producing 17 cb. m. of oxygen per hour. For the liquefaction of the air about 1 h.p. per hour is required for the production of 0.5 to 0.65 litre. The amount of compressed oxygen consumed in Switzerland rose from 250,000 cb. m. in 1913–1914 to 540,000 cb. m. in 1917–1918.—C. A. M.

Fluorine; [Electrolytic] preparation of — W. L. Argo, F. C. Mathers, B. Humiston, and C. O. Anderson, Amer. Electrochem. Soc., Apr., 1919. (Advance copy.) 11 pages.

FLUORINE can be prepared in quantity by the electrolysis of fused potassium hydrogen fluoride. A stout cylindrical copper cell (3½ in. diam. by 8 in. deep), heated electrically by a nichrome winding, is used. The cell itself acts as cathode and a graphite rod as anode. It is necessary to electrolyse at a low current density for some time in order to eliminate water, after which the evolution of fluorine takes place at a temperature of 240°–250° C. with a current of 10 amperes at 12 volts. Electrolysis of anhydrous hydrofluoric acid in a cell of the Moissan type is not suitable for commercial work, as the platinum anode is too rapidly corroded and graphite anodes are disintegrated by the hydrofluoric acid. Lead tetrafluoride, which can be readily prepared by heating lead peroxide with potassium hydrogen fluoride and crystallising from hydrofluoric acid, yields only traces of fluorine when heated. For the preparation of anhydrous hydrofluoric acid sodium hydrogen fluoride is preferable to the potassium salt.—W. H. P.

Silver sulphide. Vinal. See XI

Ammonia distillations. Davisson. See XXIII.

PATENTS.

Nitric acid; Manufacture of highly concentrated — J. W. Leitch, Huddersfield. Eng. Pat. 125,616, 12.9.16. (Appl. 12,914/16.)

A MIXTURE of weak nitric acid or sodium nitrate and weak sulphuric acid (e.g., 80% H_2SO_4) is heated in a still and the vapours are passed through a dephlegmating column the temperature of which can be regulated. Distillation may be effected under vacuum or reduced pressure. Acid of high boiling point, i.e., weak acid, condenses in the dephlegmator and returns to the still, while the stronger acid passes over and is condensed.—L. A. C.

Nitric acid and oxides of nitrogen; Manufacture of — E. B. Maxted and G. R. Ridsdale, Walsall. Eng. Pat. 126,083, 4.12.16. (Appl. 17,368/16.)

A MIXTURE of ammonia and oxygen is passed between plates or through round or flattened tubes of 1 to 5 mm. diameter, constructed of iron, nickel, cobalt, or other catalytic material, and heated to a uniform temperature. The tubes may be prepared on the inside surface with an activating agent and protected externally by means of an outer tube of silica, porcelain, or the like. The rate of flow of the gases through the tubes is so regulated that the duration of contact with the tubes is just sufficiently long to complete the reaction.—S. S. A.

Acetic acid; Manufacture of — S. Utheim, Christiania, Norway. Eng. Pat. 116,270, 13.5.18. (Appl. 8025/18.) Int. Conv., Norway, 1.6.17.

ACETALDEHYDE and oxygen are fed separately and continuously in controlled small quantities into reaction chambers consisting of narrow silver or aluminium tubes, in which the acetaldehyde is maintained as vapour and in which the reaction takes place at a pressure between 3 and 15 atmospheres, and a temperature between 70° C. and 30° C. The acetic acid is withdrawn continuously as produced.—S. S. A.

Ammonium nitrate; Manufacture of — D. Tyrer, Stockton-on-Tees. Eng. Pat. 125,621, 19.9.16. (Appl. 13,297/16.)

Two molecular proportions of sodium nitrate and one of ammonium sulphate are dissolved in as little water as possible and the filtered solution is concentrated until it boils at about 120° C. The liquor is filtered hot, 60 to 70% of the theoretical amount of sodium sulphate remaining on the filter, and then a little water and sufficient calcium nitrate solution to precipitate about 60% of the remaining sulphate are added to the filtrate. After removal of the calcium sulphate, the liquor is concentrated until it boils at 120°–125° C., allowed to cool, and the ammonium nitrate which crystallises out is separated by filtration, washed, and dried. The diluted mother liquor is used for dissolving fresh quantities of sodium nitrate and ammonium sulphate and the process is repeated.—L. A. C.

Ammonium perchlorate; Production of — C. W. Bailey, H. S. Denny, and A. J. Dunk, Langwith. Eng. Pat. 125,677, 18.1.18. (Appl. 1058/18.)

AMMONIUM sulphate is treated in solution at 30°–35° C. with sodium perchlorate, thereby precipitating crystalline ammonium perchlorate, which is collected on a vacuum filter and washed at 30° C. with hot water. The mother liquor is treated with sodium perchlorate at a temperature between 30° C. and 90° C., and the mixture heated to 100° C. The sodium sulphate which separates is collected on a heated vacuum filter and washed free from mother liquor with hot water. The residual solution of sodium perchlorate from this operation is used for treating a further quantity of ammonium sulphate. The wash waters after suitable treatment are also returned to the system.—S. S. A.

Tin compounds; Recovery of — A. W. Gregory, Greenwich. Eng. Pat. 125,879, 21.9.18. (Appl. 15,889/18.)

By treating tin solutions (e.g., sodium sulphostannate) with an ammonium salt in sufficient quantity to form, for example, ammonium sulphostannate, and heating the solution in contact with air, tin is precipitated as oxide and sulphide in a dense, easily separable form. By oxidising the solution by blowing in air or by other means, tin oxide and oxy-acids of sulphur are obtained. The precipitation may also be effected with the addition of carbon dioxide or bicarbonate during oxidation. The ammonia evolved during the process is recovered as ammonium sulphate, and used for the treatment of further quantities of tin solution.—S. S. A.

Chlorates; Apparatus for manufacturing — by an electrolytic process. T. Oiwa, Tokyo Fu, Japan. U.S. Pat. 1,297,395, 18.3.19. Appl., 23.7.18.

THE apparatus comprises a number of cells, each of which is provided with one electrode arranged on the inner surface of the tubular or cylindrical body of the cell, whilst the other electrode is in the

form of a solid or hollow cylinder placed concentrically within the cell, the terminals of the electrodes being connected in parallel. The electrolyte is made to flow upwards from below the electrodes in each cell, the liquid overflowing from the upper part of one cell and passing to the bottom of the next. Several series of crystallising tanks are connected to the apparatus for the separation of the chlorate.—B. N.

Cement-kiln dust; Leaching process for — [to recover potassium salts]. E. Anderson, Assignor to International Precipitation Co., Los Angeles, Cal. U.S. Pat. 1,298,154, 25.3.19. Appl., 4.6.17.

POTASSIUM compounds soluble with difficulty, present in cement-kiln dust, are extracted by digesting the dust with water and passing in steam under a pressure greater than that of the atmosphere, raising the temperature of the water above 100° C. A readily soluble potassium salt is thus formed.

—L. A. C.

Nitrogen; Method of fixing — [as a cyanogen compound]. F. D. Lindquist, New York, Assignor to Nitrogen Products Co., Providence, R.I. U.S. Pat. 1,298,363, 25.3.19. Appl., 15.4.16.

Two varieties of briquettes are fed into the top of a retort, both consisting of carbon, finely divided iron, and an alkaline substance which supplies the base of the cyanogen compound to be formed, but one variety containing a higher percentage of the alkaline substance than the other. The briquettes with the lower percentage of alkali are placed in contact with the walls, and as the charge passes down the retort, which is heated to a temperature sufficiently high to liquefy the alkali, at least partially, and render the briquettes plastic, any alkali which may exude from the briquettes in the centre is absorbed by the outer layer and is thus prevented from adhering to the walls, at the same time leaving a passage for the nitrogen which is also passed through the retort. The charge passes out of the bottom of the retort, is broken up, and the cyanogen compound separated.—L. A. C.

Magnesium carbonate; Process of producing — B. B. Grunwald, Assignor to A. J. Merle, Alameda, Cal. U.S. Pat. 1,298,932, 1.4.19. Appl., 5.7.18.

BRIQUETS containing magnesium sulphate and magnesium chloride is treated with a material containing sodium carbonate and bicarbonate, thereby precipitating magnesium carbonate.—S. S. A.

Hydrogen peroxide; [Electrolytic] process for making — D. Levin, Buffalo, N.Y., Assignor to Commercial Electrolytic Corporation, New York. U.S. Pat. 1,299,485, 8.4.19. Appl., 3.2.16. Renewed 14.8.18.

IN a continuous process for making hydrogen peroxide, a solution of sodium bisulphate is electrolysed to produce a 15% solution of sodium persulphate. The hydrogen peroxide is then separated and the electrolyte is purified by treatment with hydrogen sulphide and re-electrolysed.—S. S. A.

Alumina; Production of — A. G. Betts, Asheville, N.C. U.S. Pat. 1,300,110, 8.4.19. Appl., 9.2.18.

ALUMINOUS material is heated with a solution of ammonium fluoride, or other suitable salt of a volatile base. A solution of aluminium fluoride is produced which is treated with the ammonia evolved during the process, whereby alumina is precipitated and ammonium fluoride is regenerated.—S. S. A.

Hydrogen; Method of recovering — from a mixture of hydrogen with air. C. Dellwik and S. Cutler, jun., London. Eng. Pat. 125,596, 30.8.16. (Appl. 12,262/16.)

A MIXTURE of hydrogen and air (e.g., the waste mixture containing 80% of hydrogen and 20% of air discharged from balloons) is passed through a retort containing a heated mass of iron ore, iron oxide, or other suitable material. The hydrogen combines with oxygen from the ore and with oxygen from the air contained in the mixed gases. The resulting mixture is passed through a condenser to remove water, and re-circulated through the furnace until the proportion of hydrogen in the mixture is too low for it to be effective in the reaction. Steam is passed over the reduced material in the retort, thereby re-oxidising it and yielding an amount of pure hydrogen equivalent to that removed from the mixture of air and hydrogen during the reduction. The apparatus is provided with means for circulating and collecting the gases and vapour, and with suitable safety devices to minimise danger from explosion.

—S. S. A.

Hydrogen-making plants; Process relating to reducing operations in —. R. and J. Dempster, Ltd., and J. M. Ballingall, Manchester. Eng. Pat. 126,251, 16.12.18. (Appl. 20,941/18.)

IN the earlier part of the process in which iron oxide is reduced by water-gas, previously used gas is employed. Fresh reducing gas is then passed through the retorts for the completion of the reduction, and is then either passed away or conditioned for use in the earlier part of the process.—S. S. A.

Hydrogen; Apparatus for carrying out a process involved in the manufacture of —. R. and J. Dempster, Ltd., and J. M. Ballingall, Manchester. Eng. Pat. 126,256, 3.1.19. (Appl. 195/19.)

THE apparatus is provided with pipes and valves so that reducing gas (e.g., water-gas), which has been once used and subsequently freed from water, can be employed in the first stage of the reduction, being passed through the retorts and then to waste (see preceding abstract). Fresh reducing gas is then passed through the retorts, and thence through condensers to collecting chambers from which it is used for the earlier part of the process. When more than one group of retorts is employed, a continuous flow of fresh reducing gas is maintained for use in the different groups.—S. S. A.

Oxygen; Removal of — from gaseous mixtures containing it. E. A. Ashcroft, London. Eng. Pat. 125,714, 15.4.18. (Appl. 6383/18.)

A MIXTURE of gases containing oxygen is passed over an alloy of magnesium and lead at the ordinary temperature in presence of water vapour. An alloy of 15% of magnesium and 85% of lead is suitable. The process is applicable to the production of nitrogen from atmospheric air.—S. S. A.

Nitric acid and other products; Process of making —. F. S. Washburn, New York. Eng. Pat. 125,601, 1.9.16. (Appl. 12,405/16.)

SEE U.S. Pat. 1,217,247 of 1917; this J., 1917, 503. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 19,074 of 1900, 8300 of 1902, 18,594 of 1903, 19,189 of 1905, 1204 of 1906, and 6155 of 1908; this J., 1901, 1209; 1903, 420; 1904, 787; 1906, 536, 1044; 1908, 810.)

Nitre-cake; Method for the utilisation of —. J. Grossmann, Manchester. U.S. Pat. 1,298,334, 25.3.19. Appl., 2.9.16.

SEE Eng. Pat. 12,832 of 1915; this J., 1916, 1059.

Mercury oxide; Process for the manufacture of —. E. Kuhn, Basle, Switzerland. U.S. Pat. 1,299,581, 8.4.19. Appl., 30.1.19.

SEE Eng. Pat. 122,195 of 1919; this J., 1919, 322 A.

Separating certain substances [aluminium chloride and silicon tetrachloride from clay]; Process of producing and separating —. V. M. Weaver, Harrisburg, Pa., Assignor to Weaver Co. U.S. Pat. 1,300,205, 8.4.19. Appl., 7.1.15.

SEE Fr. Pat. 481,056 of 1916; this J., 1917, 144.

VIII.—GLASS; CERAMICS.

Chemical stoneware; Standardisation of —. H. Nielsen. Trans. Ceram. Soc., 1918—19, 18, 182—229.

FURTHER detailed suggestions for the standardisation of chemical stoneware are given (see this J., 1918, 57 A, 207 A). Standardisation is especially needed in Woulff's bottles and similar pieces of apparatus. Storage jars should have curved bottoms, which are stronger than flat ones. Their dimensions cannot be conformable to a simple formula, but suggested dimensions for the more important sizes are given. The ordinary condensing and cooling coils are inefficient and should be replaced by flattened coils in the form of a grid. Gas-cooling pipes should be provided with internal spirals which split up the gas current and increase the cooling effect by 20—30%. Precautions to be taken in fitting up chemical stoneware apparatus and some suggestions for making the various pieces of apparatus are given.—A. B. S.

Porcelain; Effect of time and temperature [in burning] on the microstructure of —. A. B. Peck. J. Amer. Ceram. Soc., 1919, 2, 175—194.

A FELSPATHIC porcelain body was burned under normal conditions, the temperature rising 200° C. per hour above 1150° C. Samples were drawn at 1290° C. and 1350° C., and were afterwards reheated to the same temperature and maintained there for 5 hrs. Samples were again taken and reheated as before, three burns being made exclusive of the original one, and the samples were maintained at 1290° C. and 1350° C. respectively for 15 hrs. in all. At 1290° C. the first sample showed outlines of the original clay grains, some of these being composed of sillimanite needles and others of amorphous sillimanite. The quartz grains were still sharp. After reheating at 1290° C. for 5 hrs. the sillimanite was better developed and some of the quartz had dissolved. After reheating for 10 hours, the ground mass was composed of felspar glass thickly filled with minute crystals of sillimanite; the quartz was noticeably dissolved. On reheating for 15 hrs. in all the sample showed a similar structure, but more quartz was dissolved. At 1350° C. the first sample showed glass containing minute crystals of sillimanite with a few larger ones; the quartz was noticeably dissolved. On reheating at 1350° C. for 5 hrs. the crystals of sillimanite were much larger and more quartz was dissolved. After again reheating for 5 hrs. at 1350° C. the ground mass was composed of glass with sillimanite crystals and much of the quartz was dissolved. After reheating for 15 hrs. in all, the sillimanite crystals had

still further increased in size and the quartz was almost wholly dissolved. There appear to be two types of sillimanite, *viz.*, the amorphous or fibrous type formed by the direct decomposition of the clay and the type consisting of well-formed crystals embedded in felspar glass and apparently formed by recrystallisation from solution. Comparison of mixtures of felspar and kaolin heated to 1400° C. for 3 hrs. and then quenched in water with similar mixtures treated at the same temperature in a kiln under normal conditions and cooled slowly showed that similar crystals of sillimanite were present in both cases and indicated that these are formed during the heating and not during the cooling of the ware. In the presence of molten felspar the clay appears to dissolve and sillimanite crystallises out, the size of the crystals depending on the amount of felspar or other glass present, the mobility of the glass, and the length of time of firing. The longer the duration of the firing the greater is the amount of sillimanite and the larger are the crystals. Owing to the influence of the other factors, however, the duration and temperature of firing cannot be judged from the amount or size of the sillimanite crystals present. Prolonged burning tends to produce more glass and sillimanite and therefore to increase the translucency of the porcelain.—A. B. S.

Crucibles; Behaviour under brass foundry practice of — containing Ceylon, Canadian, and Alabama graphites. R. T. Stull. J. Amer. Ceram. Soc., 1919, 2, 208—266.

A PRELIMINARY investigation showed that by using Canadian graphite in place of part (up to 25%) of the Ceylon graphite the durability of the crucible was reduced. This may be due partly to the Canadian graphite being finer and more flaky and so requiring more clay to bind it; an increase of 5% in the ball clay gave better results. Crucibles containing 55% of Canadian graphite and no Ceylon graphite were almost identical with those containing 41.25% of Ceylon graphite and 13.75% of Canadian graphite. Increased durability was obtained by replacing the Ceylon graphite by Alabama graphite either flake or granular (cooked) form, neither form being better than the other, but the results were irregular and though promising require further investigation. For larger crucibles, the particles of graphite should be larger than for small crucibles. If these are not obtainable (as when Alabama graphite is used) it may be necessary to employ sand and pot shell to avoid the slipperiness and lamination caused by fine graphite.—A. B. S.

Glaze of casseroles; Soluble lead in the —. H. Masters. Analyst, 1919, 44, 164—165.

See this Journal, 1919, 140 R.

PATENTS.

[Tunnel] kilns or ovens for firing bricks, pottery, and the like, and for other purposes. Dressler Tunnel Ovens, Ltd., Stoke-on-Trent, and H. J. Rushton, Southfields, Surrey. Eng. Pat. 126,218, 8.8.18. (Appl. 12,896/18.)

A TUNNEL oven of the Dressler type (this J., 1916, 539) but having only one combustion chamber placed centrally instead of two—one on each side of the oven. The goods or materials to be heated are carried on trucks on either side of the combustion chamber, the air in the oven being circulated through vertical and horizontal passages in the upper part of the cars and between the sides of the cars and the walls of the oven. Air in contact with the sides of the combustion chamber is heated, rises vertically to the roof of the oven and is then divided into two streams which flow in opposite

directions, returning through the passages mentioned and being reheated when they again reach the combustion chamber. By placing the combustion chamber in the position indicated a larger proportion of the heat generated is utilised, the temperature of the goods more nearly approaching that of the combustion chamber than when two chambers are arranged along the walls of the oven. The path of the circulating hot air is correspondingly reduced. In addition, by this construction the wheels of the cars are more accessible for inspection and repair, apertures, which are normally closed, being provided in the side walls of the oven.—A. B. S.

Refractory material; Manufacture of —. L. P. Kraus, jun., New York. Eng. Pat. 126,229, 6.9.18. (Appl. 14,542/18.)

SEE U.S. Pat. 1,289,049 of 1918; this J., 1919, 177A. The material is prepared by grinding a non-plastic refractory substance, such as bauxite, mixing it with carbonaceous material, *e.g.*, ground wood, roasting the mixture in an oxidising atmosphere at a clinkering temperature, and then crushing the product to obtain spongy grains free from definite cleavage planes.

Ceramic and similar material; Method of and apparatus for treating —. J. T. Underwood, Dayton, Ohio, Assignor to Underwood Engineering Co., Detroit, Mich. U.S. Pat. 1,298,125, 25.3.19. Appl. 3.11.17.

A KILN has two concentric annular flues in the sole, the inner flue being covered completely whilst the outer one has a perforated covering. A mixture of gas and air is forced through the inner flue into the kiln chamber and out through the outer flue to the chimney. Partial combustion occurs as the gaseous mixture enters the chamber, and is completed by additional air admitted separately under pressure.—A. B. S.

Quartz tubes; Method of manufacture of —. Oesterreichischer Verein für chemische u. metallurgische Produktion, Aussig. Ger. Pat. 310,831, 8.1.16. Int. Conv., 11.5.14 and 25.2.15.

A HOLLOW space of the necessary length extending between the two electrodes of an electric arc is formed in the furnace by embedding and burning out a tubular combustible conductor composed, *e.g.*, of prepared paper or wood. Alternatively, a tube composed of quartz or similar material, which will fuse to the furnace material, may be embedded between the electrodes. The method described permits of tubes of given dimensions being produced in less time and with less difficulty than do methods in which the electrodes are drawn apart.—T. St.

Brick making; Apparatus for mixing pulverised dry earths for —. A. H. E. Butler, Brunswick, Victoria. Eng. Pat. 126,217, 6.8.18. (Appl. 12,782/18.)

Glass; Borosilicate — for use as a filter to produce daylight effects. Potash glass for use as a filter to produce daylight effects. A. J. H. Haddan, London. From Corning Glass Works, Corning, N.Y., U.S.A. Eng. Pats. 125,920 and 125,921, 9.1.19. (Appls. 674 and 675/19.)

SEE U.S. Pats. 1,295,298—9 of 1919; this J., 1919, 324 A.

Refractory articles; Manufacture of —. H. Wade, London. From The Carborundum Co., Niagara Falls, N.Y., U.S.A. Eng. Pat. 126,192, 5.6.18. (Appl. 9297/18.)

SEE U.S. Pat. 1,277,227 of 1918; this J., 1918, 700 A.

IX.—BUILDING MATERIALS.

Plaster; Setting of —. C. H. Desch. Trans. (Ceram. Soc., 1918—19, 18, 15—26. (See also this J., 1918, 89 A.)

THE setting of plaster is due to the crystallisation of gypsum from a solution which is saturated with regard to the hemihydrate $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$ but strongly supersaturated with regard to gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. The resultant interlocking mass consists of sub-microscopic crystals. If the setting be retarded by addition of alcohol larger crystals are produced. The strength of the plaster after setting is partly due to the interlocking of the lath-shaped crystals and partly to the boundaries between neighbouring crystals being surfaces of strength. The conversion of the hemihydrate into gypsum is accompanied by a decrease of 7% in the volume of the crystals but the mass as a whole expands. Davis (this J., 1907, 727) has attributed this to the production of an orthorhombic modification of the dihydrate and the subsequent conversion of this into the stable monosymmetric gypsum. The author prefers to regard the expansion as solely due to the outward thrust of the gypsum crystals during their growth. Overheated or "dead burnt" plaster contains a form of anhydrite which sets slowly and very hard without expansion. Recent work suggests that the supposed modifications of the anhydrite are largely due to mere differences in the fineness of the particles. The customary inertness of anhydrite is not exhibited by the very finely ground material. The production of a sintered material (a basic sulphate which glazes the particles) may also account for some of the properties of overheated plaster. The formation of a highly porous plaster is facilitated by fine grinding both before and after burning and by avoiding overheating. To secure rapid setting a little gypsum must be present to provide nuclei for crystallisation. Gypsum and other soluble sulphates in the plaster accelerate the setting; anhydrite retards it. Old plaster moulds might be used after being finely ground, washed to remove soluble salts, burnt, and then ground very finely.

—A. B. S.

Portland cement. E. Candlot. Chim. et Ind., 1919, 2, 371—384.

THE author gives an outline of the industry, and describes the manufacture and composition of Portland cement. Illustrations are given of the various furnaces, mills, etc., used in the industry.

—W. P. S.

PATENTS.

Wood; Process and apparatus for seasoning —. M. P. Otto, Paris. Eng. Pat. 125,846, 20.7.18. (Appl. 11,904/18.)

WOOD is seasoned by subjecting it either alternately or simultaneously to the action of a gentle heat and a current of ozonised air for a period of 3 to 4 weeks; the latter solidifies (resinifies) the contents of the cells, increasing the strength of the wood and making it more sonorous. The heating is effected by steam passing through pipes in the interior of the seasoning chamber, and the ozonised air is circulated by means of fans. The volatile products of oxidation may be removed by passing a current of plain air through the chamber.

—A. B. S.

Wood preservative; Manufacture of —. F. Moll, Berlin-Südende. Ger. Pat. 310,875, 24.11.14.

ARSENIOUS acid and mercuric chloride are dissolved in strong hydrochloric acid and the solution diluted considerably with water before use. The precipi-

tation of arsenious acid from the strong solution can be avoided by the addition of beechwood tar. The mixture protects the wood against vegetable and animal pests such as termites.—H. J. H.

Cement and the like; Rotating kilns for burning —. N. Winqvist, Tollarp, Sweden. Eng. Pat. 126,230, 9.9.18. (Appl. 14,625/18.) Int. Conv., 12.6.18.

THE walls of the preheating zone of a rotary kiln are provided with projections consisting of iron gates or frames open in the direction of rotation, and so formed that they cut through the material but do not carry it along, formation of dust being thus prevented. In the part of the preheating zone where iron frames might be destroyed, they may be replaced by annular projections of refractory material.—A. B. S.

Leaching cement-kiln dust. U.S. Pat. 1,298,154. See VII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron; Thermo-electric measurement of critical ranges of pure —. G. K. Burgess and H. Scott. Bull. Bureau Standards, 1918, 14, 15—21. (See also this J., 1916, 844.)

BY a modification of the method used by Le Chatelier the thermo-electric power of the iron-platinum couple between 0° and 1000°C . in *vacuo* was determined, observations being made at intervals of 2°C . The iron used contained 99.968% Fe. The A_1 , or "allotropic" transformation was indicated by a marked discontinuity in thermo-electric power, A_2 being slightly above 910° and A_3 just below 900°C . as found by the thermal, crystallographic, magnetic, electrical resistance, and dilatation methods. The A_1 transformation was indicated by a break at 768°C ., but no discontinuity was observed below this temperature. The results are regarded as showing that A_2 and A_3 are critical points delimiting α , β , and γ iron.—W. E. F. P.

Gray iron; Improving the quality of — by the electric furnace. G. K. Elliott. Amer. Electro-Chem. Soc., Apr., 1919. [Advance copy.] 7 pages.

THE two qualities most generally wanted in high-grade gray cast iron are strength and solidity, and without exception, strong irons have high melting points and minimum fluidity. The cupola furnace is more efficient for preheating and melting than either the air-furnace or regenerative open-hearth furnace, but its thermal limitations do not allow of adequate superheating of the molten metal. A supplementary basic electric-arc furnace is suggested to effect the superheating and to refine the iron at the same time; the sulphur content of the metal is considerably reduced, and the total carbon can be regulated to any extent, so that gray iron of the so-called semi-steel quality may be obtained of uniform quality. The duplex process is commercially practicable only for castings which are required to possess physical properties of a high order.—C. A. K.

Steels; Formation of troostite at low temperature in carbon — and the influence of the temperature of emersion in interrupted quenching. Portevin and Garvin. Comptes rend., 1919, 168, 731—733.

WITH velocities of cooling (quenching) considerably higher than the critical velocities, it is possible, by interrupting the quenching, and then cooling in air,

to observe very marked recalescence (to the extent of 80° C.) at temperatures down to 450° C. and to obtain troostite after cooling. This formation of troostite at these relatively low temperatures is always accompanied by characteristic, pronounced recalescence. The troostite is formed directly and immediately from the solid solution of carbon in γ -iron at temperatures much lower than those at which it is formed during continuous quenching. With this rapid cooling it is possible, without marked alteration of the hardness, to stop the quenching at temperatures in the neighbourhood of 350° C. Working at a velocity near to the critical velocity of quenching, it has been possible to observe the commencement of the direct reaction by formation of troostite at still lower temperatures (380° C.). With velocities lower than the critical velocity, recalescence having occurred at high temperatures during the period of rapid cooling, troostite is always obtained and the temperature of emersion from the quenching bath has no appreciable effect on the structure and hardness. This limitation of the duration of quenching by removing the steel whilst still hot from the quenching bath is one of the most effective methods of preventing the formation of cracks.—W. G.

Steels; Experimental investigation of the influence of the rate of cooling on the hardening of carbon — A. M. Portevin and M. Garvin. *Iron and Steel Inst.*, May, 1919. (Advance copy.) 91 pages.

A detailed description of the apparatus and method of working by which the results previously described (this J., 1919, 179 A, and preceding abstract) were obtained. It has been possible with some carbon steels to obtain actual doubling of the point of transformation, with the consequent co-existence of troostite and martensite. The critical rate of cooling with conditions otherwise identical varies with the composition of the steel, presenting a minimum near the eutectic point. Conclusions have been reached by various authors relating to such subjects as the effect of the mass of the samples and agitation of the quenching liquid on the duration of quenching, and to the influence of the quenching temperature and temperature of the liquid on surface hardness. These conclusions are only valid when the field of operations does not include the critical rate for the particular samples.

—W. H. P.

Carbon in steel; Determination of — L. J. Rogers. *Canadian Chem. J.*, 1919, 3, 122–123.

SODA-ASBESTOS, a new absorbent mixture for carbon dioxide (this J., 1916, 1237), serves as its own drier, will absorb nearly 10% of its weight of carbon

simplified, and two new bulbs are described (see Fig.). The Midvale bulb modified according to Stetser and Norton is very simple and inexpensive. The Nesbitt tube may be shut off from the air by a slight turn of the large stopper which also permits easy filling. There are no rubber portions to catch dust, etc., and the exposed glass area is small. The use of the soda-asbestos bulb permits such a rapid flow of gas that a full factor weight of steel may be burned to fusion without altering the rate. To ensure accurate results steel of the proper fineness must be used and silicious bedding in the boats should be avoided. Nickel boats, which are among the most durable, have now been obtained of a very low carbon content and after short treatment in a muffle they give up no further carbon.

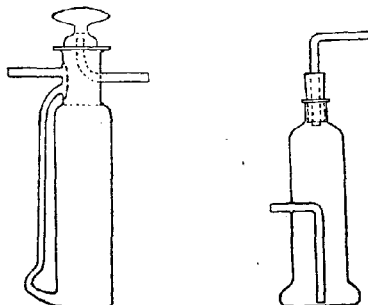
—T. H. Bu.

Sulphur; Determination of — in iron and steel.

A. Marinot. *Ann. Chim. Analyt.*, 1919, 1, 153–155. In the method of determining sulphur in iron etc. by treating the sample with hydrochloric acid and collecting the evolved hydrogen sulphide in iodine solution, the hydrogen sulphide should be passed through a small quantity of water before it enters the iodine solution. The gas is thus freed from traces of hydrochloric acid which tend to react with the thiosulphate solution used for titrating the excess of iodine and cause the results to be too high.—W. P. S.

Iron and its compounds with non-metals; Laws of the chemical action of gases on — at high temperatures. F. Schmitz. *Stahl u. Eisen*, 1919, 39, 373–381, 406–413.

In pure hydrogen at high temperatures the non-metals contained in ingot-iron, pig-iron, ferro-alloys, and steel are converted into the corresponding hydrides. These compounds partly dissociate at higher temperatures and the hydrogen set free is capable in the nascent condition, of reducing silicic acid to hydrogen silicide at 700° C. in the absence of oxygen. At high temperatures hydrogen decomposes iron salts and forms the corresponding acid with separation of metallic iron. Iron heated in presence of a gaseous compound of hydrogen and a non-metal combines with the non-metal, which diffuses into it. Special reference is made to cementation with silicon in this way. Under given conditions there is for each non-metal a certain composition of gas consisting of hydrogen and a compound of the non-metal with hydrogen, which is neutral, i.e., the non-metal neither passes into, nor is removed from, the iron. In pure hydrogen or nitrogen at high temperatures carbon and silicon in the solid state diffuse into iron. If a compound of iron with a non-metal is heated in oxygen a compound of iron, oxygen, and the non-metal is formed. If the non-metal is carbon, sulphur, or arsenic, the compound decomposes at a higher temperature with formation of a gaseous compound of the non-metal with oxygen, iron oxide remaining. If iron is heated in a gaseous compound of oxygen and a non-metal a compound is first formed of iron, oxygen, and the non-metal. If the non-metal is phosphorus or silicon the compound is stable; if carbon, sulphur, arsenic, or hydrogen, it decomposes at slightly higher temperatures with formation of iron oxide and a gaseous compound of the non-metal with oxygen. Nitrogen is inert to non-metals in solid or liquid iron. In considering how far the results can be applied in practice, the cost and danger of using hydrogen on a large scale at high temperatures are serious disadvantages. The results can, however, be applied to the chemical analysis of iron, and a table is given showing the accuracy of sulphur determinations by heating in hydrogen.—T. H. Bu.



Midvale Absorption Bulb
Stetser and Norton Modification)

Nesbitt Tube

dioxide, and can be used while the gas is flowing at a rate of 250–300 c.c. per minute. With this material the absorption apparatus may be greatly

Steels under X-rays; Testing the absorbing power of — R. A. Hadfield, S. A. Main, and J. Brooksbank. Faraday Soc., Apr. 29, 1919. (Advance proof.) 5 pages.

THE X-ray tube used had a 12" spark gap, the interrupter being of the Mackenzie-Wardson mercury type. The negatives were intensified. Examination on a fluorescent screen is not sufficiently sensitive to differentiate steels of different densities. Taking pure Swedish charcoal iron (S.C.I.) as standard, the following results were obtained by photographing on one plate the standard and a series of discs of the steel of increasing thickness.

Analysis	Sp.gr.	Thickness of specimen	Relative equivalent thickness of S.C.I.
0.19 % C, 2.45 % Al	7.57	$\frac{1}{16}$ in.	0.9
0.55 % C, 2.79 % Cr	8.77	$\frac{1}{16}$ in.	2
0.65 % C, 2 % Cr, $\frac{2}{3}$ % Ni	—	0.0309 in.	1 oil quenched
0.65 % C, 2 % Cr, $\frac{2}{3}$ % Ni	—	0.0315 in.	0.9 annealed

The oil-quenched nickel-chrome-steel is an exception to the general rule that the opacity to X-rays increases with the density of the steel.—F. C. Th.

Hair cracks in steel; Detection of — by X-rays. C. F. Jenkin. Faraday Soc., Apr. 29, 1919. (Advance proof.) 1 page.

THE detection of hair cracks in aeroplane crank shafts by radiography is not possible.—F. C. Th.

High-speed steel; Molecular constitutions of — and their correlation with lathe-efficiencies. J. O. Arnold and F. Ibbotson. Iron and Steel Inst., May 9, 1919. (Advance copy.) 24 pages.

THE carbides present in six well-annealed steels were determined electrolytically. The chromium present in the isolated residues varied from 27.27 to 62.20% of that present in the steel, the tungsten from 84.67 to 92.68%, the molybdenum from 85.29 to 94.21%, and the vanadium from 75.86 to 94.64%. The same carbides appear to be present in these complex steels as were previously found in the corresponding steels containing one special element only.

Analysis of steel					Constitution of carbides	Lathe tests on tools hardened at 1300° C. Lb. of steel removed
C	Cr	W	Mo	V		
0.75	2.79	Abs.	5.79	1.29	9Fe ₃ C+4Cr ₃ C+3V ₄ C ₃ +10Fe ₂ Mo ₃ C	111.9
0.72	2.79	Abs.	5.72	Abs.	10Fe ₃ C+3Cr ₃ C+7Fe ₂ Mo ₃ C	47.0
0.76	2.82	12.12	2.06	1.28	10Fe ₃ C+8Cr ₃ C+6V ₄ C ₃ +7Fe ₂ Mo ₃ C+23WC+42Fe ₂ W	96.1
0.82	2.80	12.00	2.06	Abs.	10Fe ₃ C+6Cr ₃ C+16WC+5Fe ₂ Mo ₃ C+27Fe ₂ W	72.0
0.55	2.62	15.93	Abs.	1.16	2Cr ₃ C+3V ₄ C ₃ +16WC+30Fe ₂ W	109.8
0.60	2.78	15.54	Abs.	Abs.	3Fe ₃ C+2Cr ₃ C+8WC+12Fe ₂ W	66.6

In the annealed condition the micro-structures consisted of a matrix of sorbitic pearlite, with globules of carbide. After hardening at 1300° C. the structures were austenitic with or without excess carbide. The heating curve of the steel with 2.8% Cr and 15.5% W showed absorption of heat at 812° C. and large absorption at 1067° C. On cooling, a single recalescence point was detected at 498° C.—F. C. Th.

Metals; Industrial X-ray examination of — E. Schneider. Faraday Soc., Apr. 29, 1919. (Advance proof.) 4 pages.

A COOLIDGE tube was used with a spark gap of 25 cm., the rays from which were capable of pene-

trating steel to a depth of 40 mm. In investigations into the heterogeneity of steel particles, those of less than 0.2 mm. diam. cannot be detected. Holes drilled in the specimens are filled with lead to prevent secondary rays fogging the plate and for the same reason the samples under examination are eased in lead. Blow-holes in castings are readily seen. The diminution in the size and number of these as a result of deoxidation by aluminium is clearly revealed. It was possible radiographically to check the casting conditions of such articles as the brackets of gun-waggons to obtain a sound product. The addition of tungsten to steel produces a marked increase in the opacity to X-rays. It is thus possible to apply radiography to replace rapid analysis in particular cases. If carbon steel bars have been mixed up inadvertently with tungsten-steel bars they can be sorted out speedily by radiography. Bars of compound metals can be investigated and the presence and distribution of the metal of greater density shown radiographically. The maximum thickness of steel which can at present be examined by X-rays is about 45 mm.

—F. C. Th.

Penetration of metals by X-rays; Principles governing — G. Respondek. Faraday Soc., Apr. 29, 1919. (Advance proof.) 20 pages.

A GENERAL discussion of the properties of X-rays, their wave lengths, coefficients of absorption, distribution of energy in the spectrum, and the changes produced when they fall upon metals and upon a photographic plate. The photographic arrangement suggested by the author for radiography of metals makes use of the resonance properties of an element of high atomic weight such as lead. The rays first penetrate the substance under test, then the glass of the photographic plate and the silver emulsion, and then they excite the resonance radiation of lead foil. The rays are best produced for this purpose by means of a Coolidge tube. It is found quite feasible to detect faulty places of 1½% of the total thickness of a layer of iron. Lead can be examined without difficulty up to 8 mm. in thickness. The method is also very convenient for the examination of reinforced concrete to detect rusting of the iron reinforcing bars.—W. H. P.

Metallic coatings for rust-proofing iron and steel. I. H. S. Rawdon, M. A. Grossman, and A. N. Finn. Chem. and Met. Eng., 1919, 20, 458–464.

A DESCRIPTION of the various metallic coatings and the methods of application, used commercially for the protection of iron and steel, is given. When the object is merely protection against corrosion the best coating is zinc, and with large regular objects the "hot dipping" method is entirely satisfactory. Heavy coatings are, however, not reliable on objects with sharp angles and other processes (e.g. sherardising, electroplating) may have to be used. These are not so convenient in operation, but may be more economical of zinc. One oz. zinc per sq. foot of surface is usually sufficient for normal purposes.

"Hot dipping" and sherardising cannot be used for hardened steel. Plating or sherardising is recommended for accurately machined parts and sherardising for threaded portions. "Spray" coatings may be necessary for large parts which must be treated *in situ*. The use of oil is always advantageous in prolonging the life of metallic coatings. The best general method for testing the protection given is by spraying with a very finely atomised solution of salt (20%) and examining for rust. Ordinary samples should last from 48 to 72 hours without rusting, and those for special exposure 96–144 hours.—W. H. P.

Iron vessels: An explosion during the welding of — A. Beythlen. *Pharm. Zentr.*, 1919, 60, 155–156.

An explosion involving loss of life occurred during the autogenous welding of iron containers. An investigation showed the presence of a dark brown substance on the inner walls which on fractional distillation in steam passed over chiefly between 210° and 230° C., and left a residue of naphthalene and heavy aromatic oil. During heating for the welding, this decomposed with evolution of inflammable gases which exploded. It is suggested that during the welding of iron containers with unknown contents the vessels should be filled with water to exclude air.—F. C. Th.

Cyanide solutions; Estimation of oxygen in working — H. A. White. *J. Chem. Met. and Min. Soc.*, S. Afr., 1919, 19, 177–178.

In the author's colorimetric method (this J., 1918, 547 A), under certain conditions a violet coloration is produced, which does not rapidly change to the usual brown tint. This is believed to be due to complex ferrous or ferric salts with tartaric acid or organic compounds containing the hydroxyl group, arising from the use of mine water containing iron. It is suggested that the water should be rendered alkaline, and then oxidised by exposure or by the addition of an oxidising agent (*e.g.*, bleaching powder).—C. A. K.

Copper; Gases from — H. M. Ryder. *J. Franklin Inst.*, 1919, 187, 508–509.

Five grams of copper was heated electrically *in vacuo* for 12-hour periods, the temperature being increased by 50° C. for each period. The gas evolved in each period was collected and analysed. The evolution of carbon dioxide shows a maximum at 350° C., similar to that obtained under similar conditions from iron and steel, various glasses, and porcelain. A large quantity of oxygen is released at 800° C., which is the temperature of decomposition of cuprous oxide. The hydrogen evolution shows a maximum near 600° C., at which temperature copper becomes permeable to hydrogen.

Brass ingots from scarf; Analysis of — R. H. Deakin. *Chem. News*, 1919, 118, 193–194.

COPPER is determined iodometrically on 0.5 grm., 2 c.c. of a 20% sodium phosphate solution being added to the solution. Zinc is estimated volumetrically by the ferrocyanide process after the removal of the copper as cuprous thiocyanate, the latter after ignition serving as a useful check on the volumetric determination of the copper. Nickel, which is present only in very small amounts, is detected after the removal of iron during the determination of the zinc. Lead, which may occur up to 2.0%, is determined by converting it into sulphate, dissolving in ammonium acetate, and precipitating as molybdate. The method for tin is to dissolve 5 grms. of the brass in *aqua regia*, dilute to 200 c.c., and add 2 grms. of ammonium chloride and 40 c.c. of ammonia. The boiling solution is

filtered, the precipitate washed with 5% ammonia, then extracted with hot hydrochloric acid (1:1) and re-precipitated with ammonia. The diluted second filtrate is treated hot with hydrogen sulphide, the tin sulphide filtered off and ignited to stannic oxide. The filtrate from the tin sulphide is boiled free from hydrogen sulphide, oxidised with nitric acid, and the iron and aluminium precipitated as hydroxides.—F. C. Th.

Electric furnace: its introduction into foundry practice. W. E. Moore. *Amer. Electro-Chem. Soc.*, Apr., 1919. (Advance copy.) 6 pages.

The electric furnace has become the most economical means for producing suitable steel for castings. Since the atmosphere of the furnace may be readily controlled, no oxidation of metal occurs during the melting operation and light scrap including "machine shop turnings" may be utilised. Degassing of the molten metal is accomplished by the use of smaller quantities of ferro-alloys, as little loss of the latter occurs. The charge may be superheated to any desired extent and this enables thin castings to be produced, of predetermined chemical composition. An acid lining is preferred owing to the simpler technique of the operations, and the cost of refractories is found to be practically half of that required in the converter process. The melting losses in the electric furnace are given as $\frac{1}{4}$ – $\frac{1}{3}$ of the loss in the open-hearth process, and $\frac{1}{4}$ – $\frac{1}{3}$ of the loss in the converter process.—C. A. K.

Lead; Softening, desilverising, distillation and cupellation of — F. von Schlippenbach. *Metall und Erz*, 1918, 18, 323–331.

THE author describes the 60-ton softening furnaces in use at Binsfeldhammer, and draws special attention to the subject of cooling jackets which are considered to be in general too thickly lined. The use of large capacity furnaces is advised, preferably 120 tons, the construction of which is described and working details given. The formation of and method of dealing with crusts are considered at some length. They are skimmed into iron pans with conical bottoms, the excess lead separating at the bottom. The Parkes process of desilverising, using 60-ton kettles, is discussed. Mechanical stirring is advised, but the author does not favour the use of the Howard press, as the separation of rich skimmings should be done in a refining furnace. The separation of zinc from the desilverised lead is considered and the material, repair, and manipulation of kettles discussed. Instead of the poor oxide usually obtained, the author has worked out a process producing oxide containing 63% Zn. Electrolytic treatment of the crusts has not proved satisfactory. They are distilled in graphite retorts or tilting furnaces, the upkeep and operation of which are discussed. With oil or gas firing the results are improved, and tilting furnaces are the better. A cheap and convenient form of receiver designed by the author is described. The zinc recovered should be 85% of the amount in the charge. The silver in retort residues may be recovered by addition of liquated works lead. The German cupellation furnaces with fixed hearths are not much used except when litharge low in silver is required in large quantities. The author describes a simple and practical cupel of rectangular shape made of stamped concrete in an iron frame; also a refining furnace with a large movable hearth, with which he obtained the best results in melting argentiferous litharge with waste metal scrapings and the desilverised residue from distillation. The refined lead with 7 to 8% silver goes forward for cupellation and the black litharge partly desilverised can be worked in the blast furnace.—T. H. Ba.

Cuprodesclowitzite; Treatment of — for extraction and recovery of vanadium, lead, and copper. J. E. Conley. Chem. and Met. Eng., 1919, 20, 465—469.

CUPRODESCLOITZITE is a lead-copper-vanadium mineral which has been located in quantity in Arizona. Attempts to obtain VOCl_3 by volatilisation with chlorine or hydrochloric acid did not prove very encouraging. The method recommended is first to fuse with nitre-cake and after extraction with water to treat with strong sulphuric acid. The residues (slimes) contain the bulk of the lead as easily recoverable lead sulphate. A portion of the free acid in the extract is neutralised with caustic soda and then strips of scrap iron are added. These yield iron vanadate and displace metallic copper. After standing for some time and removing the copper, the solution is carefully neutralised with caustic soda and boiled for several hours. The resulting precipitate is a high-grade iron vanadate.—W. H. P.

Zirconium ores and alloys; Analysis of —. A. Travers. Chim. et Ind., 1919, 2, 385—392.

THE ore is fused with sodium peroxide in a nickel crucible, the melt treated with boiling water, and filtered; the insoluble portion is boiled with an excess of hydrochloric acid, the solution rendered ammoniacal, and filtered, the precipitate being washed with hot ammoniacal 10% ammonium chloride solution. The precipitate is dissolved in hydrochloric acid, the solution nearly neutralised with ammonia, and boiled with the addition of sodium thiosulphate; the precipitate formed is collected, ignited, and weighed. It consists of zirconium oxide with titanium oxide, traces of silica, iron, and nickel; silica is separated by treatment with hydrofluoric and sulphuric acids, and the titanium oxide is determined colorimetrically after the precipitate has been fused with potassium bisulphate. The total silica is determined in a separate portion of the ore by fusion with sodium peroxide, evaporation with hydrochloric acid, filtration, separation of traces of silica from the filtrate by means of ammonia, and igniting. The ignited precipitate is treated with hydrofluoric acid and any non-volatile residue (zirconia) deducted from the total weight. Iron is determined by titration with titanium trichloride after the ore has been fused with sodium peroxide and dissolved in hot hydrochloric acid; manganese is determined by the persulphate method, and rare earths by precipitation as oxalates, zirconium oxalate being soluble. Zirconium-iron alloys usually contain aluminium; the latter may be determined by dissolving the alloy in nitric acid, evaporating the solution with hydrochloric acid, filtering, evaporating the filtrate to a syrup, extracting the iron with ether, and then precipitating the aluminium and zirconium with thiosulphate. Aluminium and zirconium are separated by fusion with alkali.—W. P. S.

Platinum gauze catalyst. Campbell. See VII.

Brass foundry crucibles. Stull. See VIII.

Carbon electrodes. Hadfield and Main. See XI.

PATENTS.

Iron and steel; Manufacture of —. G. A. Jarvis, Wellington, Salop. Eng. Pat. 126,046, 14.11.16. (Appl. 16,307/16.)

SCRAP material such as steel turnings or swarf is coated or treated with tar mixed with lime, prior to melting. If iron is to be produced, silicon carbide or carborundum waste is added to the mixture.—T. H. Bu.

Steel; Manufacture of —. R. A. Hadfield, London. Eng. Pat. 126,049, 15.11.16. (Appl. 16,389/16.)

PLATES, sheets, and shields for resisting penetration by projectiles are made of steel containing: C, up to 0.5%; Si, 0.7—2%; Mn, 0.12—0.6%; Cr, 1.5—3.0%, and Ni, 2.5—5.5%. They are heated to between 800° and 900° C., preferably 830° C., and cooled in air or other cooling medium. They may be reheated to 300°—400° C., and again cooled.

—T. H. Bu.

Steel and high-phosphorus slag; Producing — [from pig iron]. W. R. Walker, New York. U.S. Pat. 1,299,072, 1.4.19. Appl., 7.10.14.

PIG iron is de-siliconised without substantially reducing the phosphorus content. The silicious slag is then run off and the metal refined with a basic slag, which is removed before the end of the refining operation when it contains the maximum percentage of phosphorus.—C. A. K.

Ferromanganese of low phosphorus content; Method of producing slags rich in manganese for the preparation of — from slags, ores, etc., containing manganese and of high phosphorus content. A. Sonnenschein, Witkowitz. Ger. Pat. 310,552, 11.4.17.

PHOSPHORIC ores etc. are smelted in a blast furnace with the formation of phosphoric ferromanganese or spiegeleisen etc., and this is then treated in a converter with an acid lining for the production of manganese-rich slag free from phosphorus. This slag by further treatment yields ferromanganese etc. of low phosphorus content.—T. St.

Case-hardening. S. Whyte, Redhill. Eng. Pat. 125,666, 19.10.16. (Appl. 14,830/16.)

A CASING of white iron is formed by heating iron or steel articles in a bath of borax, e.g., at 1200°—1400° C., in the presence of graphite carbon. A current of air is preferably passed through the bath. If an electric current is applied to the bath, using the article to be coated as one electrode, the casing is produced more rapidly, and if the work is made the anode, a casing of high carbon content (with Fe_3C as the limit), is produced, and the sharp edges of the article are rounded off. If the work is used as cathode a casing of approximately eutectic composition (0.9% C) is produced, and the angles of the article remain well defined. An alternating current may be employed. Where a thicker casing is required, the article may be dipped into molten iron-carbon alloys, or other metallic alloys, under molten borax.—C. A. K.

Zinc; Electrolytical production of —. G. H. Clevenger, Palo Alto, Cal., U.S.A. Eng. Pat. 115,846, 7.5.18. (Appl. 7665/18.) Int. Conv., 7.5.17.

SEE U.S. Pat. 1,283,077 of 1918; this J., 1919, 79 A. A manganate or permanganate is used as oxidising agent, and a soluble manganese salt is added to the electrolyte if not already present in sufficient quantity.

"Blue-powder"; Production of —. F. F. Farnham, Fairbairns, Pa., Assignor to National Metal Molding Co., Pittsburgh, Pa. U.S. Pat. 1,299,445, 8.4.19. Appl., 4.12.16.

HIGHLY heated zinc fume is condensed continuously in a closed chamber, and cooled below the temperature of ignition in air. The blue powder is agitated on removal in order to free it from entrapped carbon monoxide.—C. A. K.

Alloys; Process for refining —. Stabilimenti "Blak" Ing. A. Pouchain, Assignees of P. Peynetti, Turin, Italy. Eng. Pat. 116,277, 7.5.18. (Appl. 7648/18.) Int. Conv., 7.5.17.

THE mechanical properties of alloys having a copper, aluminium, or zinc basis are improved by introducing a small quantity of one or more of the metals composing the alloy—preferably the metal having the greatest affinity for oxygen—in the form of a fine powder enclosed in a metallic envelope of low melting point, into the mould for the ingot or casting.—T. H. Bu.

Impregnating and coating metals with other metals. A. C. Hyde, London, and A. Jude, and Belliss and Morcom, Ltd., Birmingham. Eng. Pat. 125,630, 25.9.16. (Appl. 13,568/16.)

A CORE of metal (*e.g.*, steel) is enclosed within an envelope of a more fusible metal (*e.g.*, copper) and heated to about the fusing temperature of the coating metal in an atmosphere of hydrogen or carbon monoxide. The composite metal is then subjected to a wire-drawing or other equivalent mechanical operation. When steel or iron is employed as a core, a coating of oxide on the metal is an advantage, as a spongy iron film is produced in the reducing atmosphere, and a better interpenetration of the metals results. The process is applicable to a core of powdery material (*e.g.*, tungsten) enveloped by a more ductile metal, and a second coating of a still more fusible metal may be applied to the first. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 1924 and 1928 of 1906; this J., 1906, 552.)—C. A. K.

Coating with metals. F. J. Metzger, Assignor to Air Reduction Co., Inc., New York. U.S. Pat. 1,299,988, 8.4.19. Appl., 30.10.18.

THE coating metal is fed to the flame of a coating torch supplied with a combustible gas consisting of ethylene and oxygen.—T. H. Bu.

Copper-nickel matte; Treatment of — to separate the metals. B. Mohr and C. Heberlein, London. Eng. Pat. 125,642, 29.9.16. (Appl. 13,853/16.)

FINELY ground copper-nickel matte is roasted, and then reduced and leached with 10% sulphuric acid at 80°–90°C. A deposit of nickel is obtained by electrolysis the dilute solution of nickel sulphate so produced, and the resulting acid solution is used for leaching a fresh quantity of the reduced matte.—C. A. K.

Alloys from volatile substances, or metals, and other metals; Method and apparatus for producing —. E. G. Burr, Montreal, Canada. Eng. Pat. 125,785, 1.5.18. (Appl. 7311/18.)

A METAL (*e.g.* copper) is heated in a crucible and the heat of the molten metal is used to vaporize a volatile metal or other substance (*e.g.* phosphorus), contained in a closed retort, constructed of material of low thermal conductivity, and placed above the level of the molten metal in the crucible. A central tube conducts the vapour from the space above the surface of the material in the retort into the molten metal in the crucible near its base. The rate of evaporation of the volatile metal varies with the pressure set up by the head of molten metal in the crucible, and means may be provided for adjusting the distance between the retort and the molten metal in the crucible according to the boiling point of the volatile substance.—S. S. A.

Alloys. R. A. Hadfield, London. Eng. Pat. 126,053, 16.11.16. (Appl. 16,459/16.)

IRON-NICKEL-MANGANESE alloys high in nickel for electrical and other purposes are composed of nickel 32–40%, manganese 0.3–8%, carbon 0.05–1.5%, and the remainder iron. A preferred composition is iron 63%, nickel 36%, manganese about 0.9%, carbon 0.05–1%. The alloys may be made by adding molten metallic manganese and nickel or their alloys to decarbonised and desilicified iron.—T. H. Bu.

Alloy. C. Van Amburgh, Tacoma, Wash. U.S. Pat. 1,300,038, 8.4.19. Appl., 2.10.17.

AN alloy consisting chiefly of aluminium with smaller proportions of copper, tin, and silicon.—T. H. Bu.

Furnace for heating metal articles and other like uses. Gibbons Bros., Ltd., and R. Masters, Dudley. Eng. Pat. 126,163, 14.5.18. (Appl. 8040/18.)

A FURNACE of similar kind to that described in Eng. Pat. 7208/12 (this J., 1913, 294) but less expensive in construction consists of a dome-shaped chamber, fitted with a number of charging doors at the floor level. Heating gases, from a fire-grate, or gas-producer situated below the hearth, are introduced through a central port in the furnace bed and the waste gases pass down vertical flues between the charging doors. Zig-zag horizontal regenerator passages are provided near the sides of the fuel chamber or gas-producer and the heated secondary air meets the combustible gases before passing through the central port into the furnace.—C. A. K.

Blast furnace [tuyère]. F. O. Miller, Portsmouth, Ohio. U.S. Pat. 1,298,761, 1.4.19. Appl., 8.8.18.

THE discharge opening of the tuyère is at an angle to the main portion, and the angular section is lined with refractory material at the place where the direction of the blast is deflected.—C. A. K.

Electric furnace for smelting ores. A. E. Book-walter, Coeur d'Alene, Idaho. U.S. Pat. 1,297,641, 18.3.19. Appl., 26.4.17.

THE furnace comprises a shell, polygonal in cross-section, resting on a rectangular base, the latter having along its central portion a relatively narrow well provided with an outlet for molten metal. Two electrodes lying on the base on opposite sides, spaced from, but parallel to the well, and abutting against the side walls, extend from one end to the opposite end of the furnace. The base is inclined downwards from the electrodes to the well, thus forming a support for the ore, which is melted by the current passing between the electrodes.—B. N.

Furnace; Melting — with crucibles of quartz or quartz-glass. Westinghouse Metallfaden-Glühlampenfabrik, G.m.b.H., Atzgersdorf, Austria. Ger. Pat. 308,308, 11.4.17.

QUARTZ crucibles may advantageously be used for foundry work in furnaces heated by gas and wholly or partially lined with quartz.—T. St.

Open-hearth furnaces; Method and apparatus for shortening the treatment period in —. W. Mathesius, Charlottenburg. Ger. Pat. 310,574, 19.9.17.

IN the early stages of the reaction the heating gas is supplied to the furnace by the upper port so that the air comes into direct contact with the charge,

and at a later stage the gas and air are changed over with respect to the regenerators. The reversing gear consists of a stationary plate with a superposed rotating bell. In the underplate the gas and air channels belonging to the right or left side of the furnace are placed diametrically opposite to each other, and the passage to the chimney is connected to the centre. At any given time two of the diametrically opposed passages are connected with the chimney while the other two serve for the supply to the furnace of gas and air respectively.—T. St.

Zirconium ores; Process of purifying — W. R. Loveman, Lakewood, Ohio, Assignor to National Carbon Co., Inc. U.S. Pat. 1,297,371, 18.3.19. Appl., 1.9.15.

CRUDE zirconium and titanium ores are heated with an excess of hot concentrated sulphuric acid practically to dryness, the dried mass crushed, and its soluble constituents extracted with dilute sulphuric acid. The solution is treated with sodium thiosulphate at about 100° C., to precipitate hydrated zirconium oxide, and the precipitate filtered off, and calcined to remove water and adhering sulphur.—C. A. M.

Malleablestizing cast metal; Method of — W. G. Webster, Highland Park, Mich., Assignor to H. Ireland, Detroit, Mich. U.S. Pat. 1,298,607, 25.3.19. Appl., 9.1.18.

A METAL casting is placed in a container, capable of being hermetically sealed, together with a quantity of combustible material sufficient to combine with the oxygen present, and to produce a positive pressure of gas in the container. The sealed container is subjected to heat, and the contents are allowed to cool before removal.

—C. A. K.

Flotation; Device for the aeration and emulsifying of pulp for — C. Taylor, Nogales, Ariz. U.S. Pat. 1,299,059, 1.4.19. Appl., 8.11.17.

PULP for flotation treatment is caused to pass through a pipe, and air is drawn in at different points in the length of the pipe so as to cause admixture of air with the pulp before the latter enters the flotation tank.—C. A. K.

Molybdenum; Method of extracting and recovering from ores and concentrates. H. A. Doerner, Denver, Colo. U.S. Pat. (A) 1,299,559 and (B) 1,299,560, 8.4.19. Appl., 18.1.17 and 15.3.18.

(A) MOLYBDENUM-BEARING material is heated to fusion and treated with free chlorine to combine with, and volatilise the molybdenum as chloride. The reaction may be carried out by electrolysis a bath of fused alkali chlorides containing the molybdenum ore. (B) Molybdenum ore is briquetted with sodium chloride together with a material capable of yielding sulphur, and the briquettes are fed into a heated vertical chamber through which a downward current of air is maintained. Chlorine is liberated in the furnace and volatile molybdenum chlorides are conveyed away by the air current, and condensed.—C. A. K.

Nickel scrap and sludge; Process for treating [to recover platinum]. W. McA. Johnson, Hartford, Conn. U.S. Pat. 1,299,577, 8.4.19. Appl., 3.8.17.

THE residues from the electrolysis of commercial nickel, which are comparatively rich in platinum, are classified into coarse and fine particles. The fine particles are subjected to a further settling treatment and separated into heavy sludge and fine slimes. The latter contain most of the platinum.

—C. A. K.

Muffled ore-converting apparatus. A. M. Beam, Assignor to The American Continuous Refort Co., Denver, Colo. U.S. Pat. 1,299,661, 8.4.19. Appl., 10.12.17.

TWO horizontal chambers are arranged one above the other so that heating gases may circulate around them. Ore charged into one end of the upper chamber is moved by scrapers to the opposite end and is conveyed by a shoot into the lower chamber in which it is moved by oppositely inclined scrapers to the discharge end. The scrapers are connected to frames mounted on slideways on opposite sides of the oven, and move in unison.

—C. A. K.

Metal briquette. F. A. Vogel, Assignor to General Briquetting Co., New York. U.S. Pat. 1,299,878, 8.4.19. Appl., 26.10.18.

DIRT and foreign substances are destroyed and cutting oil removed from metal waste such as turnings and borings, by crushing the metal, annealing the pieces produced, and then cooling them under non-tempering conditions, preparatory to briquetting.—T. H. Bu.

Sintering ignition process. C. W. Adams, jun., Murray, Utah, Assignor to American Smelting and Refining Co. U.S. Pat. 1,299,892, 8.4.19. Appl., 19.1.17.

A UNIFORM layer of red-hot ore is spread on the top of a charge of the ore to be sintered and subjected to a downward current of air. For ores containing sulphur the temperature of the layer of red-hot ore should be high enough to ignite the charge, but not high enough to distil more than a small amount of the sulphur.—T. H. Bu.

Powdered ores, flue dust, etc.; Furnace for drying, calcining, and sintering — W. Schumacher, Berlin. Ger. Pat. 310,572, 19.5.17. Addition to Ger. Pat. 306,032 (this J., 1918, 629 A).

TO prevent the possibility of the roasted material adhering to the inclined iron plates of the furnace originally described, vertical tubes are placed at short intervals from each other, either in front of, or embedded to a depth of somewhat more than half their cross-section in the iron plates.—T. St.

[Copper] sulphide ores containing ferric salts; Method of leaching — Ilobaer St. Stefan Gewerkschaft, Budapest. Ger. Pat. 310,525, 18.12.15.

THE ore is roasted at not higher than 360° C. under the greatest possible concentration of sulphur dioxide, so that the iron and sulphur remain as ferrous sulphate. The mass is then leached to remove the greater part of the soluble compounds, and subjected to an oxidising roasting to produce sufficient ferric sulphate to allow of the recovery, in the final leaching, of precious metals.—T. St.

Metal sulphides [pyrites]; Treatment of with silicon or silicon alloys with recovery of the sulphur combined with the metals. Det Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank, Christiania. Ger. Pat. 310,526, 26.3.15.

PYRITES containing copper is heated with silicon, preferably in an electric furnace, to about 1500° C. out of contact with air. Ferrosilicon is formed, sulphur is distilled off, and the copper is concentrated in a matte.—T. St.

Alloys and metals [zinc]; Method of melting — M. Lissauer u. Co., and W. Venator, Cologne. Ger. Pat. 310,971, 18.3.17.

Oxidation of the metal is avoided by maintaining an atmosphere of inert gas inside an air-tight melting vessel at a pressure exceeding atmospheric. —T. St.

[Double] pointing metallic articles [wire blanks]; Machine for — by electrolytic action. M. O. Anthony, Englewood, N.J., Assignor to A. Kimball Co., New York. U.S. Pat. 1,298,153, 25.3.19. Appl., 4.8.16.

Silver; Process of extracting — from ore. M. H. Caron, Weltevreden, Java, Assignor to Research Corporation, New York. U.S. Pat. 1,298,454, 25.3.19. Appl., 16.7.17.

See Eng. Pat. 101,665 of 1916; this J., 1916, 1161.

Volatile metals; Method of refining — S. Hultdt, Stockholm. U.S. Pat. 1,298,722, 1.4.19. Appl., 7.8.16.

See Eng. Pat. 101,211 of 1916; this J., 1917, 460.

Metal [tungsten] and its manufacture. A. Pacz, Cleveland, Ohio, Assignor to General Electric Co. U.S. Pat. 1,299,017, 1.4.19. Appl., 25.5.14.

See Eng. Pat. 15,961 of 1914; this J., 1915, 875.

Zinc-bearing materials; Electrolytic refining of metallic — C. H. Aldrich and J. K. Bryan, Baltimore, Md., Assignors to Electrolytic Zinc Co., Inc., New York. U.S. Pat. 1,299,414, 8.4.19. Appl., 26.7.16.

See Eng. Pat. 108,312 of 1917; this J., 1918, 518 A.

XI.—ELECTRO-CHEMISTRY.

Carbon electrodes used in electric steel-making furnaces; Radiographic examination of — R. A. Hadfield and S. A. Main. Faraday Soc., Apr. 29, 1919. (Advance proof.) 10 pages.

CARBON electrodes are made of amorphous carbon or of graphite. The former are the more heterogeneous and give more trouble in use. The X-ray examination was carried out with a Coolidge tube of 6 in. spark gap distant 20 in. from the plate, using a current of 2 milliamps, and an exposure of 1 minute. The impurities could be easily seen on the fluorescent screen. Stereoscopic examination was used. The results threw little light on the behaviour of the electrodes. It is not easy to identify the individual fragments of retort-carbon, anthracite, etc., which compose the electrodes. The graphite electrodes give structureless radiographs in which cracks are readily seen. The physical and radiographic properties of a few of the electrodes examined are tabulated.—F. C. Th.

Silver sulphide; Some electrical properties of — G. W. Vinal. Bull. Bureau of Standards, 1918, 14, 331—339.

A STRIP of silver sulphide rolled at room temperature possesses a large negative temperature coefficient of resistance. A wire of the sulphide drawn through a draw-plate at about 200° C. possesses a zero temperature coefficient of resistance. The strip simultaneously conducts the current metallically and electrolytically, whereas the wire is a metallic conductor only. The resistance

of the strips, using alternating current, was nearly always higher than when direct current was used. The resistance of the sulphide was temporarily increased by the passage of an alternating current as small as 8.8 milliamperes, of a frequency as low as 60 cycles, whereas a small direct current produced the opposite effect. Employing a strip of dimensions 55×0.3×0.01 cm. with silver-plated ends soldered to copper leads, a visible discoloration of the plating of the anode end was obtained when a current of 200 milliamperes was passed. Shiny silver crystals appeared in the middle of the strip, and up to within a small fraction of a mm. of the anode terminal, when a current less than 300 milliamperes was passed. No visible decomposition occurred when alternating current up to 600 milliamperes was employed. The specific resistance of the wire at 25° C. was 17,300 microhm-cm.—J. S. G. T.

Dielectric liquids; Decomposition of — under the influence of an electric arc. E. Urbain and C. Scal. Comptes rend., 1919, 168, 887—889.

AN arrangement is described by means of which an arc started in a dielectric liquid with a high frequency current between two electrodes may be continued by a current of sufficient intensity but low voltage. Under these conditions the tetrachlorides of titanium, tin, and carbon are decomposed, chlorine being evolved; saturated liquid hydrocarbons give acetylene, ethylene, and hydrogen, and carbon is deposited; pinene gives the same gases and there is marked formation of isoprene; ketones yield carbon monoxide and various hydrocarbons. In the case of organic dielectric liquids the process of decomposition is different according as the liquid is maintained at 15° C. or at its boiling-point, the decomposition being more complete in the latter case.—W. G.

Nelson chlorine cell. Carrier, jun. See VII.

Sodium hydrosulphite. Jellinek. See VII.

Sodium permanganate. Wilson and Horsch. See VII.

Silicon tetrachloride. Hutchins. See VII.

Fluorine. Argo and others. See VII.

Electrical filter. Lamb and others. See XIXs.

PATENTS.

Electric furnaces. J. Bibby, London. Eng. Pat. 125,179, 2.9.18. (Appl. 3726/18.)

THE opening in the top of the furnace through which the electrode passes, is sealed by means of superposed rings divided into segments. The rings are of curvilinear form in cross-section with a comparatively thin inner portion, so that they adjust themselves to the electrode and prevent the passage of flame. The rings are contained in a casing, the space between the casing and the rings being charged with loose refractory material, and a guard ring closely fitting the casing also bears upon the superposed divided rings.—B. N.

Electric arc furnaces. F. H. A. Wielgolaski. Christiania, Norway. Eng. Pat. 125,518, 24.4.18. (Appl. 6875/18.)

AN arc furnace, for the treatment of gases, is of the type in which double or multiple arcs are stretched out into an elongated or U-shaped form.

comparatively cold and electrically badly-conducting reaction gases being blown into the space between the arc legs and through openings along the whole length of the furnace space. The gases, owing to their poor electrical conductivity and their movement, prevent the arc bight from being withdrawn towards the electrodes and prevent short-circuits, whilst also assisting in a high degree in forcing the arc bight towards the gas outlet end of the furnace. The furnace may be divided into two or more parallel compartments (according to the phase number) connected together by slots, and the gas inlet may be between the two compartments with a projecting surface opposite, the latter dividing the current of gas and directing each portion into its own compartment, or the inlet openings may be arranged tangentially to each compartment. Auxiliary electrodes may be arranged in the slots between the compartments. In a further alternative form, the gases are admitted at suitable points so that they sweep over a wider or smaller part of the inner wall faces of the furnace compartments before passing between the arc legs. Each compartment is provided with a central outlet for the reaction products, or a common central outlet is arranged, which is situated in the elongation of a slot connection between the different furnace compartments.—B. N.

Electric furnaces; Control of power absorbed in — C. C. Gow and D. F. Campbell, London. Eng. Pat. 125,522, 11.5.18. (Appl. 7957/18.)

The power absorbed in an electric furnace is maintained at a predetermined value, by moving the electrodes by means of a supply of fluid pressure controlled by an electromagnetic device energised by current from a source independent of the load circuit, the strength of the current being regulated by means of variable resistances automatically adjusted according to the power supplied to the load circuit. This adjustment is accomplished by a solenoid or other equivalent device energised by the secondary winding of a transformer, of which the primary winding is traversed by the whole or a portion of the current supplied to the electrodes of the furnace, or the solenoid may be connected in parallel across a low resistance traversed by the load current. Other resistances may be arranged in parallel with the automatically-adjusted variable resistance, and are adapted to be operated manually in order to adjust the predetermined value of the current maintained in the movable electrode. For the purpose of adjusting the predetermined value of the power supplied to the furnace, tappings may be taken from the secondary windings of the current transformer to the solenoid, either in lieu of or in combination with the resistances operated by hand. The solenoid may be provided with an additional winding, energised by a current dependent upon the voltage between the electrode and the charge.—B. N.

Electric furnace. A. E. Greene, Seattle, Wash. U.S. Pat. 1,297,149, 11.3.19. Appl., 12.10.17. Renewed 9.8.18.

The furnace comprises a horizontal cylindrical steel shell lined with refractory material, and with a dished and flanged steel head riveted to each end. An opening extending along the top of the cylinder is closed by an arched roof, and electrodes pass through the roof and the hearth of the furnace. Suitable openings are arranged for charging and discharging material, the furnace being supported on a track on which the shell may be rolled for tilting to the required angle.—B. N.

Electrolytic cell. J. Harris, Lakewood, Ohio. Assignor to J. R. Rose. U.S. Pat. 1,297,157, 11.3.19. Appl., 29.9.17.

SEVERAL cells are arranged within a tank, each of the cells having openings in opposite walls and electrodes arranged within the openings. A bar of conducting material is interposed between the electrodes in each unit, with means, mounted in one of the walls of the tank and co-operating with the side of the unit adjacent to it, for exerting pressure upon such electrodes, so as to hold the units in an assembled position.—B. N.

Chemical changes; Production of — by oscillatory discharge. E. F. Northrup, Princeton, N.J., Assignor to The Ajax Metal Co., Philadelphia, Pa. U.S. Pat. 1,297,393, 18.3.19. Appl., 13.7.17.

NITROGEN in air is converted into nitric acid, by passing an oscillatory current across a gap between a solid electrode and mercury in the presence of air. The mercury nitrate, which is produced, is subsequently treated to decompose it into nitric oxide, nitric acid, and mercury.—B. N.

Electrolytic baths; Method of handling anodes in — H. M. Stuart, Baltimore, Md., Assignor to Electrolytic Zinc Co., Inc., New York. U.S. Pat. 1,299,519, 8.4.19. Appl., 26.7.16.

See Eng. Pat. 108,311 of 1917; this J., 1918, 96 A.

Electric furnace and transformer for use therewith. F. E. Berry, Hayes. U.S. Pat. 1,299,664, 8.4.19. Appl., 19.1.18.

See Eng. Pat. 115,247 of 1917; this J., 1918, 380 A.

Removing suspended particles. Eng. Pat. 125,681. See I.

Electric separator. U.S. Pat. 1,297,159. See I.

Separating finely-divided materials. U.S. Pat. 1,298,409. See I.

Dehydrating oil. U.S. Pat. 1,297,378. See II A.

Separating emulsions. U.S. Pat. 1,299,589-90. See II A.

Treating liquor from reduction of nitrated derivatives. U.S. Pat. 1,298,513. See III.

Chlorates. U.S. Pat. 1,297,395. See VII.

Hydrogen peroxide. U.S. Pat. 1,299,485. See VII.

Quartz tubes. Ger. Pat. 310,831. See VIII.

Ozonising substances. U.S. Pat. 1,297,716. See XIX B.

XII.—FATS; OILS; WAXES.

Fats; Hydrolysis of — by means of sulpho-aromatic fatty acids. L. Ubbelohde and W. Roederer. Solfenfabr., 1918, 38, 425-429, 449-453, 475-476. Chem. Zentr., 1919, 90, II., 365.

COMPARATIVE experiments in which fats were hydrolysed under the same conditions with five

different agents (viz., the naphthalene-sulpho compounds of oleic acid, of castor oil and its fatty acids, and of hydrogenated castor oil and its fatty acids) showed that there was no difference in the speed or degree of hydrolysis effected by any of them. On the other hand, the colour of the fatty acids and of the glycerin water is much lighter when hydrogenated castor oil compounds are used than with the other reagents. The view formerly expressed that the velocity of the reaction varies with the hydrolytic agent employed must be attributed to the preparations having contained different proportions of free sulphuric acid. The use of a larger amount of the hydrolytic agent causes the emulsion to be more persistent, and this results in greater hydrolysis.—C. A. M.

Arachis oil; Hydrogenation of — F. Heim, A. Job, and H. Sturzwege. Bull. de l'Office Coloniale, 1918, 11, 355–361. Bull. Agric. Intell., 1919, 10, 108–109.

ARACHIS oil hydrogenated to a hard fat, with nickel formate as catalyst, melted at 58° C., solidified at 47.8° C., and had iodine value 13.5.—C. A. M.

Seeds of the evening primrose [Oenothera biennis]; Fatty oil from the — A new linolenic acid. A. Heiduschka and K. Lüft. Arch. Pharm., 1919, 287, 33–39.

THE air-dried seeds of the evening primrose contain water 13.95%, crude proteins 13.38%, fat 16.93%, fibre 14.56%, nitrogen-free extractives 35.03%, and ash 6.15%. The oil was obtained by extraction of the crushed seeds with ether and formed a golden-yellow liquid resembling poppy oil in taste and smell; it remained completely liquid at 0° C., but a few solid particles separated at –11° C. It had sp. gr. at 15° C., 0.9283; n_D^{40} = 1.4722; acid value, 0; saponification value, 195.2; Reichert-Meissl value, 2.61; Polenske value, 0.57; iodine value, 148.92; Hehner value, 94.94; acetyl value, 13.9. It was optically inactive and a member of the class of drying oils. The volatile fatty acids consisted mainly of caproic acid (0.81%). Separation of the unsaturated and saturated fatty acids was effected in the usual manner by means of the lead salts and the former were brominated in ethereal glacial acetic acid solution. Under these conditions a sparingly soluble hexabromo- γ -linolenic acid, microscopic needles, m.p. 196°–196° C. (decomp.), separated which, when treated with zinc and alcohol, yielded γ -linolenic acid as a yellow substance of unpleasant odour. Tetrabromo- α -linoleic acid, tetrabromo- β -linoleic acid, and dibromo-oleic acids were identified in the filtrates from hexabromo- γ -linolenic acid. The unsaturated fatty acids contain γ -linolenic acid (2.50%), α -linoleic acid (30.20%), β -linoleic acid (38.11%), and oleic acid (29.19%). Oxidation of the unsaturated fatty acids with permanganate yielded dihydroxystearic acid, a mixture of tetrahydroxystearic acids, and γ -hexahydroxystearic acid, minute needles, m.p. 245° C. (decomp.). Fractionation of the saturated fatty acids from alcohol or by means of their magnesium salts led to the isolation of palmitic acid and a substance the properties of which agreed with those of daturic acid; theoretical considerations caused the authors to doubt the natural occurrence of the latter acid, and experiments on the fractional distillation of the substance with steam showed that the "daturic acid" obtained from the evening primrose at any rate was a mixture of palmitic acid (and possibly stearic acid) with acids of greater molecular weight. The unsaponifiable matter of the oil contained phytosterol (2.27%).—H. W.

Prune kernels; Analysis of — L. Fordyce and D. M. Torrance. Chem. News, 1919, 118, 242–243.

PRUNE kernels extracted with ether yielded 42% of oil, about a third of which was deposited as a solid mass on cooling the liquid to –5° C. The solid portion resembled palm-kernel oil and had sp. gr. 0.9055 and saponification value 239.8. The liquid portion had sp. gr. 0.9119 and saponification value 207.4. The original kernels contained 2.47% of nitrogen, whilst the fat-free residue contained 2.21%. When extracted with water the kernels yielded 37.42% of sugars, mainly levulose and dextrose.—C. A. M.

Dogwood oil. W. Normann. Chem. Umschau, 1918, 25, 49–50. Chem. Zentr., 1919, 90, II., 365–366.

THE fruit pulp of the dogwood tree, *Cornus sanguinea*, when dried yielded 30.7 and 35.3% of oil, whilst the kernels of the seeds yielded 8.76 and 12.26%. The fruit oil was of a dark colour, had a pleasant aroma, and gave the following results:—Acid value, 4.2–37.5; saponif. value, 192–194; iodine value, 115.5–195.4; refractometer reading at 25° C., 65.8–68.8; and unsaponifiable matter, 1.65–2.9%. The kernel oil had the following characters:—Acid value, 2.5–108; saponif. value, 193–197; iodine value, 143.8–147.8; refractometer reading, 75.4–75.7; and unsaponifiable matter, 0.4–1.1%. The berries of the white dogwood, *Cornus stolonifera*, contained 21.23% of oil with the following characters:—Acid value, 7.8; saponif. value, 197; iodine value, 114.2; refractometer reading, 68.5; and unsaponifiable matter, 0.67%.—C. A. M.

"Benefing" oil, a substitute for linseed oil. Bull. de l'Office Coloniale, 1918, 11, 345–370. Bull. Agric. Intell., 1919, 10, 109.

"BENEFING" seed from a plant which grows wild in the Niger district and also in Madagascar, where the natives term it "voa matavy," contains a drying oil which can replace linseed oil for industrial purposes. The oil, extracted from the seeds by primitive methods, is used in all the workshops of the Kayes railway in the Niger district. In Madagascar it is used as an edible oil.—C. A. M.

Ether; Recovery of — in fat determinations. J. Grossfeld. Z. Unters. Nahr. Genussm., 1919, 37, 81–82.

APART from the recovery of ether by distilling the contents of the extraction flask, a considerable further quantity of the solvent may be recovered by distilling the extraction thimbles in a suitable apparatus. If the thimble contains much extracted material and is itself thick and porous, some 50% of the ether used in the extraction may remain in the thimble.—W. P. S.

Fatty residues from the Gerber process [of determining fat in milk]; Use of — for soap-making. F. Reiss. Milchz. Zentr., 1919, 48, 75–77.

THE fat separated in the Gerber process for the determination of fat in milk etc. may be collected, washed with water to remove sulphuric acid, and then saponified to form a soap. The average saponif. value of the fat is 220.4; the fat contains about 22% of amyl esters, and, if desired, the quantity of alkali used for the saponification may be restricted to four-fifths of that required for total saponification so as to leave these esters unsaponified and available for perfuming the soap.

—W. P. S.

Utilisation of yeast. Schweizer. See XVIII.

Fat-soluble vitamins. Drummond. See XIXa.

PATENTS.

Oils, fats, sugar, and so forth; Apparatus for use in the extraction of — from materials yielding the same. J. de Raedt, Court St. Etienne, Belgium. Eng. Pat. 126,262, 24.1.19. (Appl. 1849/19.)

A HORIZONTAL cylindrical drum adapted to oscillate on trunnions is provided with charging doors for the material at the side, the charging being effected by turning the drum through 90° to bring the doors to the top. The drum is divided into compartments by porous or perforated horizontal plates, and near the bottom of the drum is a filter consisting of filtering medium enclosed between two perforated horizontal plates. The drum is provided along the top and bottom with a number of domes or openings to which the flexible inlet and outlet mains for the solvent are connected. When the extraction process involves heating, steam-circulating pipes are provided just below each of the perforated partitions. An arrangement of pipe connections and valves may be provided whereby after the material has been charged into the drum, the air may be exhausted and the material warmed by hot solvent vapour and then washed with the solvent as desired. The residual solvent may then be recovered by injecting steam generated from air-free water.—W. F. F.

Drying machine [for copra]. A. B. Starr, Brooklyn, N.Y. U.S. Pat. 1,297,926, 18.3.19. Appl., 7.11.16.

A MACHINE for drying copra contains a chamber with a perforated bottom to which heated air is delivered. The material is passed through the chamber on a series of superposed endless conveyors arranged in two sets driven at different speeds, each conveyor, excepting the lowest in each set, being provided with means for delivering its contents to the one immediately below it, whilst the lowest conveyors discharge the material into shoots.—C. A. M.

Polyoxy fatty acid esters; Process for the production of —. E. H. Zollinger, commonly known as E. Zollinger-Jenny, Zurich, Switzerland. Eng. Pat. 112,624, 8.1.18. (Appl. 483/18.) Int. Conv., 8.1.17.

HYDROXY-FATTY acids or their glycerides (e.g. castor oil) are converted into polyoxy-fatty acids by the action of heat, condensation agents or the like, and these fatty acids are converted into esters by means of hydroxy-fatty acid esters. For example, castor oil is heated for several hours with water at a pressure of 8 to 10 atmos. in an autoclave. The fatty acid, which is to a large extent polymerised, is separated and heated to about 180° C., until it has been largely converted into triricinoleic acid. This is mixed with half its quantity of castor oil and heated to 220°–230° C. *in vacuo*, in the presence of metallic zinc as catalyst, until the mixture is practically neutral. The product consisting largely of the triglyceride of tetraricinoleic acid is a thick oil having the technical properties of castor oil. By using the methyl or ethyl ester of ricinoleic acid instead of castor oil products more fluid than the glyceride are obtained.—C. A. M.

Esters; Processes of hydrolysis or saponification of —. C. F. Cross and C. Dreyfus, London. Eng. Pat. 125,153, 19.6.16. (Appl. 8035/16.)

GLYCERIDIC oils or fats are treated in a methyl or ethyl alcohol medium with a fractional equivalent

of alkali or base so that the alcohol of the medium takes part in the decomposition of the ester. The process may be carried out at the ordinary temperature in the case of oils or at about the m.p. of the glyceride in the case of solid fats. Alternatively the glyceride may be treated with a fractional equivalent of caustic soda or other alkali (not exceeding one-third of the combined acid) dissolved in alcohol (the weight of which must not exceed that of the glyceride, and preferably should not exceed one-third of that weight). After mixing and emulsification the mixture may be transferred to another vessel to complete the reaction. The same processes may be used in the hydrolysis of cellulose acetates. For example, by such controlled hydrolysis a thread of cellulose acetate artificial silk may be brought to any degree of approximation to cellulose, and its textile uses and dyeing properties correspondingly modified.—C. A. M.

Fats and oils; Method of hydrolysing — into glycerin and fatty acids. W. Happach, Malmö, Sweden, and Sudfeldt und Co., Melle. Ger. Pat. 310,455, 29.11.11.

SULPHO acids of petroleum or its distillates are used as hydrolytic agents for the decomposition of oils and fats. For example, sulphonated petroleum hydrocarbons are separated from the deposit of tarry matter, and washed with alkali solution, the uncombined hydrocarbons extracted from the soap solution by means of benzene, etc., and the purified sulpho acids liberated by the addition of an excess of sulphuric acid. From 0.5 to 1% is required to hydrolyse fats, and the resulting fatty acids are of better colour than those obtained by Twitchell's process.—C. A. M.

Saponaceous compositions and process of manufacturing the same. W. Feldenhelmer, London, and W. W. Plowman, East Sheen. Eng. Pat. 125,491, 11.4.18. (Appl. 6170/18.)

CLAY (1 cwt.) is suspended in water (120 to 125 lb.) containing a deflocculating electrolyte (about 14% of the weight of clay of 98% sodium hydroxide) so as to bring the clay into the sol condition. After thorough agitation the mixture is incorporated with fluid soap (2½ to 8 cwt.) and preferably at about the same temperature (e.g., 120° F., 49° C.) as the soap. Under these conditions more clay can be incorporated with soap than has hitherto been possible.—C. A. M.

Saponifying glycerides; Process of —. B. E. Reuter, Assignor to Reuter Process Co., Chicago, Ill. U.S. Pat. 1,298,563, 25.3.19. Appl., 9.4.14.

See Eng. Pat. 9393 of 1915; this J., 1916, 1163.

Dehydrating oil. U.S. Pat. 1,297,378. See IIa.

Sulpho acids from mineral oils. Ger. Pat. 310,925. See IIa.

Plastic material. Eng. Pat. 125,607. See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Imitation amber for mouthpieces of tobacco pipes etc.; Composition of — from a hygienic point of view. N. Tarugi and G. Cloni. Boll. Chim. Farm., 1919, 58, 101–106.

CERTAIN specimens of imitation amber which when used as mouthpieces had caused pronounced irritation of the mucous membrane were found to have

the following composition:—Water, 6.32; calcium phosphate, 8.38; casein ($N \times 6.25$), 56.25; formaldehyde, 28.47; colouring matter and loss, 0.58%. Formaldehyde was liberated from the casein compound by the action of tobacco smoke, and also by the hydrolytic action of saliva. It is suggested that the sale of mouthpieces of such composition should be prohibited.—C. A. M.

PATENTS.

Lead products [white lead]; Process of manufacturing certain —. W. P. Thompson, Liverpool. U.S. Pat. 1,297,934, 18.3.19. Appl., 6.2.15. Renewed 5.2.19.

LEAD monoxide dust manufactured as described in Eng. Pat. 100,069 of 1916 (this J., 1917, 385) is cooled, and treated, with agitation, at 90°–140° F. (32°–60° C.) with carbon dioxide and the vapours of acetic acid, together with sufficient water vapour to yield hydrated white lead.

—C. A. M.

Shellac-substitute; Process of producing a —. J. R. Köhler, Stockholm. Eng. Pat. 120,729, 7.11.18. (Appl. 18,253/18.) Int. Conv., 23.10.17.

NATURAL resin, preferably old material or resin which has been submitted to oxidation, e.g., by ozone, is powdered and treated with petroleum spirit, benzol, oil of turpentine, or similar solvents which extract the crystalline resin acids and leave the amorphous oxidised resin acids; these can be separated from impurities such as bark fragments by extracting with methyl or ethyl alcohol, the resulting solutions being capable of use as substitutes for solutions of shellac and of yielding a solid shellac substitute on evaporation.—D. F. T.

Colophony of high quality; Process of producing — from old natural resins of conifers. J. R. Köhler, Stockholm. Eng. Pat. 122,407, 6.1.19. (Appl. 369/19.) Int. Conv., 15.1.18.

THE crystalline resin acids in old natural resins, which may be first finely divided, are extracted by means of a solvent, such as oil of turpentine, petrol or benzene, which will dissolve such acids, but will not dissolve to more than a slight extent the amorphous products consisting mainly of oxidised resin acids. On evaporating the solvent a residue of light-coloured colophony of high quality is obtained.—C. A. M.

Resin and process for manufacturing the same from crude solvent naphtha. M. Darrin, Wilkinsburg. Assignor to H. Koppers Co., Pittsburgh, Pa. U.S. Pat. 1,297,328, 18.3.19. Appl., 6.9.18.

CRUDE solvent naphtha is treated with a solution containing sulphuric acid in sufficient strength to polymerise the dark resin-forming constituents without material polymerisation of the coumarone-indene compounds. The mixture is distilled to separate the dark resins, the distillate treated with stronger sulphuric acid to polymerise the coumarone-indene compounds, and, after neutralisation of the excess of acid, redistilled, and the resulting light coloured resin freed from volatile oils by blowing a gas through it.—C. A. M.

Resin; Obtaining — from parts of plants. C. Bauer, Berleburg. Ger. Pat. 310,504, 29.4.17.

PARTS of plants containing resin are heated in an aqueous solution of a salt such as calcium chloride to extract the resin. The process may be carried out by placing the material in a porous vessel, which is immersed in the salt solution.—C. A. M.

Varnish; Apparatus for manufacturing —. C. H. Bennett, Chicago, Ill. U.S. Pat. 1,298,159, 25.3.19. Appl., 18.5.16.

A VARNISH composition is cooked in a movable vessel and is then transferred in the vessel to a blending vessel situated at a distance from the heating medium. The contents of the heating vessel are transferred, by means of a pump, to the blending vessel, which is closed and fitted with a stirrer and with a reflux condenser, and as the liquid flows into the vessel it is mixed with a solvent led in through another pipe.—L. A. C.

Plastic material for use in gas checks for gun breech blocks and other purposes. Schneider et Cie., Paris. Eng. Pat. 125,607, 5.9.16. (Appl. 12,560/16.) Int. Conv., 18.5.16.

FOR making gas check rings for gun breech blocks, a mixture of asbestos with an insoluble soap, such as lime soap, and an oleaginous substance such as petroleum jelly is used. The soap is prepared by saponifying colza oil with 13% of its weight of slaked lime, and then colza oil is added to reduce the proportion of lime to 8%. The soap or both the soap and the petroleum jelly are dissolved in a volatile solvent to facilitate mixing with the asbestos, the solvent being removed by subsequent evaporation.—D. F. T.

Turpentine substitute. Eng. Pat. 126,089. See IIa.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Caoutchouc; Synthesis of —. H. Staudinger. Schweiz. Chem.-Zeit., 1919, 1, 1–5, 28–33, 60–64.

IN polymerising isoprene compounds of the terpene series are simultaneously produced, in quantities varying with the conditions of polymerisation, and these influence the character of the final product. Synthetic preparations although very similar to the natural product are not yet identical, as has been shown by Steimmig (this J., 1914, 267). In order to obtain a tougher synthetic rubber attempts have been made to mix the isoprene with styrol, linseed oil, and especially tung oil, but the products are all more or less sticky. The ordinary inorganic and organic peroxides such as sodium peroxide and benzoyl peroxide, do not accelerate the polymerisation to such an extent as pure oxygen, but, like ozone, are used in technical processes as catalysts. The varieties of rubber obtained by polymerising butadiene and dimethylbutadiene differ in characteristics from the isoprene product, and methylcaoutchouc from dimethylbutadiene is now an important synthetic product in Germany. The yield of isoprene from oil of turpentine is increased by carrying out the process *in vacuo* (this J., 1911, 1023). By using limonene instead of oil of turpentine the yield is increased from about 25% to 65%. Essential oils, however, cannot be obtained in sufficient quantity to be practicable sources of isoprene. The production of butadiene from phenol and of isoprene from cresol would be too expensive, whilst these substances are required for other purposes. Coke-oven gases are a cheaper source of benzene, and synthetic rubber has been successfully prepared in Germany by converting this benzene successively into cyclohexane, chlorocyclohexane, and tetrahydrobenzene, which, on heating, gives butadiene and ethylene. The amount of butadiene and isoprene in coal tar would only furnish a small fraction of the amount required, whilst the conversion of alcohol into butadiene would be too expensive, apart from the fact that the most favourable conditions for the reactions have yet to be

discovered. If impure butadiene hydrocarbons are used sticky products are formed. American petroleum contains at least 1% of a mixture of the three pentanes (boiling at 9°, 30°, and 38°C.), which at the present time is practically a worthless constituent of the gases. About 370,000 tons per annum of these compounds would be available in the United States. It has been shown by Holt (this J., 1914, 364) that they could be converted into isoprene, but this synthesis would only be practicable in America. Acetone prepared from acetylene was used in Germany during the war as the source of synthetic rubber. It was reduced by means of aluminium to pinacene which was then converted into dimethylbutadiene and dimethylcaoutchouc. The plant is capable of producing about 2000 tons of rubber per annum, but under normal conditions the process would be too expensive.—C. A. M.

Gas-mask fabrics. Perrott and Plumb. See V.

PATENTS.

Vulcanisation of rubber and similar materials. Dunlop Rubber Co., Ltd., London, and D. F. Twiss, Sutton Coldfield. Eng. Pat. 125,696, 20.3.18. (Appl. 4941/18.)

THE glycerol or glycol used as a solvent for caustic potash or soda for the purpose of ensuring a uniform introduction of the alkali into a rubber mixing (see Eng. Pat. 110,059; this J., 1917, 1185) can be replaced by other organic hydroxy-compounds such as butyl alcohol, amyl alcohol, or phenol.—D. F. T.

Coated fabrics. Eng. Pat. 125,622. See V.

XV.—LEATHER; BONE; HORN; GLUE.

Anthrax; Formic acid and mercuric chloride treatment of hides affected by —. V. Gegenbauer. Arch. Hyg., 1918, 87, 289—315. Chem. Zentr., 1919, 90, II., 132—133.

THE Seymour-Jones process for the sterilisation, by means of formic acid and mercuric chloride, of hides affected with anthrax, has been subjected to a series of trials. Experiments were made following the technique of Ottolenghi with mercuric chloride solutions of 0.1, 1.0, and 2.0% strength, which effected sterilisation only after 80 days, and with a 0.01% solution which required 100 days. A solution of 0.02% strength in combination with 1, 2, or 5% of formic acid did not sterilise in 40 days. Growth was obtained in albumin bouillon after 100 days' action of a 1% solution of mercuric chloride. Growth was also obtained from anthrax spores (from which all traces of mercuric chloride had been carefully removed by centrifuging and decanting, but without treatment with sulphides) after the spores had been subjected to a 0.01% solution for 20 days, to a 0.1 or 1% solution for 8 days, and to a 2% solution for 2 days. In the same series of experiments growth of the spores could still be observed after 8 days' action of 0.025—0.10% solutions of mercuric chloride, and 4 days' action of a 1% solution in combination with 1% formic acid. After the action of hydrogen sulphide solution on the spores and subsequent washing, 1% and weaker solutions of mercuric chloride together with 1% formic acid did not effect sterilisation even after 14 days. Anthrax spores treated by the Seymour-Jones method proved pathogenic when introduced into guinea-pigs. The conclusion is that for practicable concentrations

and times of action the method is in no way effective.—F. C. T.

Tannin and the synthesis of similar substances. E. Fischer and M. Bergmann. Ber., 1919, 52, 829—854.

THE removal of acetyl groups from substances such as the acetates of galloyl- and digalloyl-glucose, previously effected with cold alkali or with warm sodium acetate solution, can also be effected at the ordinary temperature by a moderate amount of concentrated aqueous hydrochloric acid in methyl-alcoholic solution. If the acetyl-derivative is too sparingly soluble in methyl alcohol, a mixture of the latter with acetone may be used. The penta-(*m*-digalloyl)- α - and - β -glucoses obtained in this manner from the acetates are optically purer than those previously described. The method can also be applied with good results to simpler substances such as acetylsalicylic acid and triacetyl-gallic acid. The use of the potassium salt for the purification of tannins was recommended by Berzelius; the authors find the most convenient method of preparation to consist in mixing alcoholic solutions of the natural or synthetic tannins and potassium acetate, but the precipitates contain small amounts of the latter. The salts appear to be suitable for the purification of artificial tannins but not for their identification. Attempts to extend the method used in the preparation of 1-monogalloyl- β -glucose (this J., 1919, 47 A) to other 1-acylglucoses gave disappointing results, the acyl-group being frequently removed simultaneously with the acetyl groups. This is the case, for example, with 1-benzoyltetra-acetyl- α -glucose, but not with the corresponding *p*-hydroxybenzoyl-derivative. The catalytic action of sodium alkoxide on esters in alcoholic solution has been applied for the removal of acetyl groups. Thus, for example, for the elimination of the five acetyl groups of *p*-acetoxybenzoyl-tetra-acetylglucose dissolved in alcohol, one molecule of sodium ethoxide is sufficient at the ordinary temperature and the presence of a small quantity of water in the alcohol does not hinder the reaction; these conditions are particularly advantageous for securing good yields. The method has also been applied to the isolation of glucose from its penta-acetate and of α -methylglucoside from its tetra-acetate. The galloyl-derivatives of the sugars differ considerably in their behaviour towards gelatin solutions. The penta- and tri-galloyl compounds precipitate the latter from aqueous solution in the same manner as do the tannins, but this property is not shown by the various monogalloyl-glucoses nor by monogalloylfructose. Since similar differences were to be expected among polyhydroxy-alcohols, the derivatives of glycol, trimethyleneglycol, glycerol, erythritol, and mannitol have been prepared and examined. The crystalline ethylene-glycol digallate is so sparingly soluble in water or alcohol that its reaction with gelatin or arsenic acid could not be investigated. With trimethyleneglycol digallate the gelatin test is not characteristic but distinct gelatinisation is caused by arsenic acid in alcoholic solution. Erythritol tetragallate is readily soluble in water and coagulates gelatin, but the alcoholic solution is too dilute to be tested with arsenic acid. The amorphous glyceryl trigallate and mannitol hexagallate yield colloidal solutions in water and behave like tannins towards both reagents. (See also J. Chem. Soc., 1919, I., 278.)—H. W.

Depsidic, lichen substances and tannins; Synthesis of —. E. Fischer. Ber., 1919, 52, 800—829.

A résumé of the progress made in this field by Fischer and his co-workers since the year 1913.

—H. W.

Chestnut bark; Colour tests of — T. G. Greaves. J. Amer. Leather Chem. Assoc., 1918, 13, 467—469.

COLOUR tests of tanning infusions made by the tintometer or colorimeter have the advantages that they may be expressed numerically and that results obtained by different operators are in fair agreement. Tanning tests made with skivers cannot be numerically expressed but give an idea of the probable colour of the leather produced in actual manufacture. The two methods, however, do not give mutually consistent results. As measured by the colorimeter, chestnut bark infusion is three to six times darker per unit of tannin than the infusion of the chestnut wood, whereas skivers tanned with the bark are lighter in colour than those tanned with the wood. There is therefore no advantage in peeling the wood for extract manufacture unless the colour is to be tested by the colorimeter, as in Europe.—F. C. T.

Chestnut [tanning] extract; Sugar in — C. T. Galey and O. Riethof. J. Amer. Leather Chem. Assoc., 1918, 13, 470—476.

SOME chestnut extracts do not ferment readily and hence do not produce sufficient acid for the plumping of heavy leather. This the authors thought might be due to a low content of sugars. Extraction experiments were carried out with a battery of six autoclaves to determine the effect of temperature on the sugar content of the resulting extract. An extract prepared at 290° F. (143° C.) contained four times as much sugar as one prepared at 210° F. (99° C.), and more than twice as much per unit of tannin. This is thought to be due to the breaking up of cellulosic constituents of the wood. Analyses of commercial extracts also showed that those prepared in autoclaves contained considerably more sugar than those prepared in open leaches.—F. C. T.

Sulphite-cellulose [in tanning extracts]; Procter-Hirst test for — J. H. Yocum and E. S. Nelson. J. Amer. Leather Chem. Assoc., 1918, 13, 395—396.

50 GRMS. of ground spruce wood was heated with 300 c.c. of a 25% solution of caustic soda for 6 hrs. at 100° C. After the addition of 150 c.c. of water, the solution was filtered through cloth, then nearly neutralised with hydrochloric acid and filtered through paper. The solution gave no precipitate in the Procter-Hirst test until 24 hrs. had elapsed, but there was immediate precipitation if a small quantity of sodium bisulphite was added to the solution, with or without heating. The lignones appear therefore not to react of themselves but need the presence of a sulpho-group in an organic complex.—F. C. T.

Yeast growing in tan liquors; Physiological researches on a new film-forming — T. Asai. J. Coll. Sci., Imp. Univ., Tokyo, 1918, 39, Art. 37. 42 pp.

A SPECIES of mycoderma discovered in a tannery in Senju, Tokyo, causes dark brown surface discolorations on leather which cannot be removed by acids or bleaching treatment. The mycoderma develops rapidly and in 3 or 4 weeks forms a thick red-brown skin on the liquor. The cells of the organism are ellipsoidal, 3.2–4 μ wide and 8–11 μ long. Usually there are two or three highly refractive bodies attached to the cell wall or in the vacuole, together with, occasionally, 2, 3, or 4 oil droplets. Spores are not formed and reproduction is by budding. A large colony, grown in a single day on soy-agar, was grayish-white, net-like in the centre, and radially folded at the periphery, which

was irregularly toothed. A colony on wort-agar was thin with very many radial folds, but smooth and without folds at the edge. In liquid media the organism forms a folded grayish-white skin which covers the whole surface, and which within a week mostly settles as a flocculent precipitate rendering the solution turbid. The precipitate formed in a week from 30 c.c. of medium weighed 0.176 gm. when dry. Sojl (yeast extract) forms the best medium. The yeast grows rapidly when incubated with certain carbohydrates (e.g. dextrose, levulose) and with 1% ethyl alcohol; other strengths of alcohol from 0.1 to 10% allow less rapid growth. Tannin permits no growth at 3% strength, and little in weaker solutions, but there is considerable growth with gallic acid even in the presence of tannin. Ammonium salts are good sources of nitrogen for the organism, but not nearly so good as amino-acids and peptone. The mycoderma ferments dextrose, levulose, mannose, maltose, sucrose, but not galactose, lactose, or dextrin. The production of acids in the tan-liquor is hindered by this organism, as it assimilates both acids and alcohols, with the exception of oxalic acid, which it produces and which is undesirable. In the presence of other sources of carbon, the organism will use up as much as 60% of the lactic acid in a 3% solution. The stains produced on leather by this mycoderma have no connection with the "mimosa stain" mentioned by Eitner (Gerber, 1898, 24, 4). —F. C. T.

Shark skin leather. A. Rogers. J. Amer. Leather Chem. Assoc., 1918, 13, 528—530.

SHARK skins cannot be limed in the ordinary way as they disintegrate. They are best treated for two days in a 0.2% solution of caustic soda after soaking, and then should be well washed and fleshed. The grain side should be worked with a blunt knife to remove shagreen as much as possible. After bating with ammonium chloride, the skins are tanned by the two-bath chrome process using sodium bisulphite for the reducing bath. They may be finished direct, but are best re-tanned with quebracho, after which they are fat-liquored or stuffed. Leather of exceptional durability results from this process.—F. C. T.

Gelatin solutions; Setting point of — A. Coblenzl. Chem.-Zeit., 1918, 42, 533—534.

SETTING points of 5% gelatin solutions were determined by the use of a thermometer, graduated in tenths of a degree, inserted through a cork in a measuring cylinder nearly filled with the solution, which was kept in constant gentle motion. Cooling was very slow, especially when within 2° or 3° of the expected setting point. Three temperatures were noted, viz., the point of first solidification, recognisable by a wave-like surface at the walls of the cylinder and by a slight cessation in the fall of temperature, sometimes even by a slight rise; the point at which only small air bubbles (1 mm.) move with the liquid whilst larger ones (10 mm.) still slowly rise; and the point of complete solidification. Results were easily reproducible by this method over a period of 5 years with an accuracy of two or three tenths of a degree. Long standing of jellies, especially at higher temperatures, causes a depression of the setting point, and a diminution of the rigidity of the gelatin. The same effect is caused by additions of organic acids and of alkali. Alcohol keeps the solution more fluid and lowers the setting point considerably, but increases the rigidity of the gelatin. Basic aluminium and chromium solutions raise the setting point of gelatin solutions and also the rigidity of the gelatin, and ultimately render the gelatin insoluble. In

this case also long warming of the solution lowers the setting point. The addition of acid to a solution containing alum lowers the setting point but does not affect the rigidity of the gelatin on drying. Formaldehyde in small quantities does not affect the setting point, the hardening effect not being perceptible before drying.—F. C. T.

Leather; Examination and valuation of military —. E. Seel, K. Hils, and K. Reihling. Z. angew. Chem., 1919, 32, 4–7.

GERMAN military leathers and others from prisoners' camps in Germany were analysed in considerable numbers. Only Russian leathers proved to be under-tanned; French and Serbian as well as German leathers were well-tanned. The combination colour reaction described by Hundeshagen (Chem. Zentr., 1902, II., 752) is considered superior to the usual glacial acetic acid test for detecting under-tanning. None of the leathers examined proved to be weighted with inorganic materials, the mineral ash ranging from 0.5 to 1.5%. Sulphates were present only in traces. Little sugar was found in the leathers, the highest amount being 1.4% after inversion. A feature of the analyses is the large number of positive tests for artificial tannins, in particular for Neradol D; only in three cases was artificial tannin absent from the German leathers. Ordoval G, a product introduced by the Badische Company during the war, was not once detected. A comparison was made between Neradol D, Neradol ND, and Ordoval G as follows:

	Litmus	Congo Red	BaCl ₂	HCl + BaCl ₂	Filtrate from previous pptn. boiled 2 hrs. under reflux.
Neradol D	red	blue-violet	ppt.	considerable ppt.	ppt.
Neradol ND	red	pure blue	ppt.	extremely slight ppt.	no ppt.
Ordoval G	red	blue-violet	ppt.	very slight ppt.	no ppt.

The authors make several observations on the necessity for the absence from military leathers of free sulphuric acid, which was found in several instances.—F. C. T.

PATENTS.

Leather; Manufacture of —. D. McCay, Calcutta. Eng. Pat. 122,084, 19.3.18. (Appl. 4837/18.)

HIDES or skins after the usual wet work are treated for periods up to 12 or 24 hrs. with mercuric chloride solution of 5% strength or less, after which they are thoroughly washed in water or very weak alkali. The washed skins are treated with formaldehyde solution containing from 1% to 10% of 40% formalin until they are "leathery." This is effected in less than 24 hrs. even with weak solutions. The skins must be oiled or fat-liquored before drying. The process may be combined with vegetable tanning.—F. C. T.

Chrome tanning; Solutions for —. E. Meyzonier, Jun., Annonay, France. Eng. Pat. 123,785, 3.12.17. (Appl. 17,879/17.)

BICHROMATES are reduced by sodium sulphite and sulphuric or hydrochloric acid and the solution rendered basic by a further addition of sulphite. —F. C. T.

Tanning process. S. Saxe, New York. U.S. Pat. 1,297,255, 11.3.19. Appl., 4.3.18.

RELATIVELY heavy leather, such as sole leather, is prepared by partially tanning hide in relatively weak vegetable tan liquor, and then completing the tanning in a drum by means of a stronger liquor containing osage orange wood extract.—C. A. M.

Plastic masses; Process of preparing — from casein. E. Zillich, Berlin. Ger. Pat. 310,388, 26.1.15.

CASEIN, with or without the addition of pigments, is mixed with hydrogen peroxide into a homogeneous mass, and pressed in moulds. Glycerin or fatty or mineral oils may also be added to the mixture. The pressed material is hardened by means of formaldehyde to which it is advisable to add some hydrogen peroxide to prevent unequal shrinkage.—C. A. M.

XVI.—SOILS; FERTILISERS.

Soils; Injurious actions of potassium and sodium salts upon the structure of — and their causes. G. Hager. J. Landw., 1918, 66, 241–286.

AN extensive series of experiments was made with saline solutions flowing through soils having base-exchanging properties. The saline solution was afterwards washed out with water, and the effects of the application upon the physical properties of the soil were observed. It was found that the base-exchanging properties of a soil were dependent upon the presence of weak acids the compounds of which undergo hydrolysis liberating the combined bases as hydroxides. If the base is divalent, the action on the soil is favourable, but if it is monovalent the action is unfavourable. The hydrolysis of compounds of weak acids is prevented by the presence of a dissociated salt with the same cation, and therefore when alkali salts are present in the soil solution there is no separation of alkali hydroxide and no deterioration of soil structure. This explains why soils which had been inundated with sea water showed no deterioration until after the sodium chloride had been washed out, whereupon hydrolysis of the soil zeolites set in and alkali hydroxides appeared in the soil solution. These alkali hydroxides caused the soil particles to form a dense mud, in contradistinction to the granular condition of the particles when in association with calcium compounds. Sodium salts were more injurious in this respect than potassium salts.—J. H. J.

Fluorine in soils, plants, and animals. L. A. Steinkoenig. J. Ind. Eng. Chem., 1919, 11, 463–465.

THE fluorine content of soils (average 0.03%) is derived from such minerals as biotite, tourmaline, muscovite, apatite, fluorite, and phlogopite; larger quantities are found in soils containing mica. Roots of plants absorb the fluorine and the latter is transmitted to animals consuming the plants (see Gautier and Clausman, this J., 1916, 271). Animals also obtain fluorine from spring water.—W. P. S.

Ammonification of manure in soil. H. J. Conn and J. W. Bright. J. Agric. Res., 1919, 16, 313–350.

A STUDY of soil before and after manuring with animal manure was carried out in order to determine the species of bacteria which brought about the ammonification process. It was found that in a manured soil the organisms multiplying most

largely were non-sporing bacilli; whereas in the same soil before being manured, spore-bearing bacilli were numerous. This pointed to non-spore-bearing bacilli being the active agents in ammonification rather than spore-bearing. Experiments were made with pure cultures of two organisms of the former class, namely, *Bacillus fluorescens liquefaciens* and *B. caudatus*, and one organism of the latter class, *B. cereus*, in sterile manured soils. The results confirmed the general conclusion given above. A detailed study of the characters of *B. fluorescens liquefaciens* and *B. caudatus* is given.—J. H. J.

Stable runnings; Preservation of — by the addition of various substances. O. Lemmermann and H. Wiessmann. Landw. Jahrb., 1918, 52, 297–341. Chem. Zentr., 1919, 90, II., 346–347.

It is estimated that the value of the nitrogen escaping into the air from stables etc. in Germany exceeds M. 500,000,000 per annum. The urea and hippuric acid in the urine are rapidly converted by bacterial action into ammonium carbonate, from which the ammonia escapes. In experiments with various substances it was found that lignite of a humic character fixed 5.12% of ammonia, forming a product which lost part of its nitrogen at 100° C., but was very stable at the ordinary temperature. The addition of 50 to 60% of dried lignite (containing 80% of dry substance) acted as a complete preservative, and the preparation gave better results as a fertiliser than ammonium sulphate fertilisers containing the same amount of nitrogen. Peat also fixed the ammonia, the combined nitrogen not being completely volatile at 100° C., but, using 20% of peat, the loss of nitrogen after 62 days amounted to 62%. The addition of 1.5 to 2% of sulphuric acid (66° B., sp. gr. 1.84) prevented any loss of nitrogen, whilst sodium bisulphate (35.01% H₂SO₄) was effective when added in the proportion of 7%. After the addition of 10% of superphosphate the loss of nitrogen after 62 days was 27.48%. Kainite was ineffective, but gypsum diminished the loss of nitrogen. The addition of 0.25% of formalin to fresh cow's urine inhibited the fermentation of the urea, whilst the addition of 6% and upwards to the stable runnings reduced the loss of nitrogen to 1.7% after 62 days. Small quantities of zinc chloride and copper sulphate checked the fermentation of the urea, but other salts, including sodium chloride, sodium sulphite, and sodium tetrathionate, were useless, even in the proportion of 10–12.5%.

—C. A. M.

Oxidising enzymes. Onslow. See XVIII.

PATENT.

Fertilisers; Production of —. E. C. R. Marks, London. From Soc. Anon. Ital. Gio. Ansaldo & Co., Genoa, Italy. Eng. Pat. 125,718, 16.4.18. (Appl. 6445/18.)

See U.S. Pat. 1,282,385 of 1918; this J., 1919, 48 A.

XVII.—SUGARS; STARCHES; GUMS.

Granulated white beet sugar and plantation white cane sugar. H. C. Prinsen Geerligs. Int. Sugar J., 1919, 21, 227–231.

UNREFINED plantation white cane sugar contains reducing sugars or "glucose," gummy substances, and insoluble matter, from which unrefined washed beet sugar is free, or practically so. Although the small amount of "glucose" that is present in plantation white sugar is without effect in the

manufacture of jam, condensed milk, mineral waters, etc., its presence appears to be detrimental in the preparation of certain kinds of confectionery, causing the product to become soft and sticky after a short time. Gummy substances and insoluble matter are objectionable impurities in sugars used by jam and preserve manufacturers, who demand a product giving a brilliant solution, the colour of which within limits may not be of importance. In the ordinary method of clarification followed in cane sugar factories, in which the juice is treated with lime, heated, and allowed to subside, the supernatant liquid passing to the evaporators contains a greater or less amount of gummy, siliceous, and fibrous matters, which ultimately during graining are held between the lamellae of the crystals, and cannot be removed by washing in the centrifugals. On the other hand, in the carbonatation process of clarification, the voluminous precipitate produced occludes the gummy substances and insoluble matter, leaving a juice that can be filtered through cloth, and yields a sugar which does not differ in composition from granulated beet sugar except for the small amount of "glucose" that remains. Plantation white sugar containing gummy substances and insoluble matter may be submitted to a partial refining process to adapt it for use by jam, chocolate, and biscuit manufacturers by treatment with decolorising carbon and filtration.—J. P. O.

Beet sugars; Insoluble matter in standard white granulated —. C. G. Leonis. Sugar, 1918, 20, 357. Int. Sugar J., 1919, 21, 249–250.

BEET sugar factories in the United States produce a granulated white sugar which is sold for direct consumption without refining. Occasionally on dissolving this product in water a white turbidity is produced. This may be due to lack of care during sulphitation, calcium bisulphite passing into the filtered syrups, and being subsequently decomposed to calcium sulphite during boiling in the pan or drying in the granulator. Again, if the sulphited syrups are insufficiently heated amorphous calcium sulphite is formed, and passes through the filter-cloths. It may sometimes happen that such white beet sugars show a slight turbidity when recently made, but less after storage for 90 days or more. This is explained by the presence in the sugar of free sulphurous acid, which slowly transforms the calcium sulphite into the acid salt; on boiling solutions of such products a white precipitate may be formed, whereas the liquor previously was comparatively clear. The phenomenon may also be due to the oxidation of calcium sulphite into calcium sulphate.—J. P. O.

Sugar products; Measuring the colour of —, particularly liquors treated with decolorising carbon. F. W. Zerbán. Louisiana Planter, 1918, 61, 282–283. Int. Sugar J., 1919, 21, 250–251.

TREATMENT of sugar liquors by decolorising carbon removes different colouring matter in different proportions. Thus, in the case of a particular sugar product it was found that the decolorising carbon "Norit" removed 82.5% of green, 80.0% of red, 78.5% of yellow, and 80% of the total colouring matters originally present; whereas "carbon 15" prepared by the author removed practically all the green, 90% of the red, 96% of yellow, and 97% of the total colouring matters.—J. P. O.

"Carbrox," the decolorising carbon prepared from rice hulls [; its use in refining sugar]. H. M. Shilstone. Louisiana Planter, 1917, 58, 364–365. Int. Sugar J., 1919, 21, 249.

WITH the object of producing white sugar directly from cane juice, experiments have been made in Louisiana both with "norit" and the rice hull

decolorising carbon known as "carbrox" (this J., 1918, 599 A). It is claimed that 1 lb. of "carbrox" will decolorise a liquor containing 100 lb. of washed sugar, eliminating the "tannins" (this J., 1918, 778 A; 1919, 192 A), and ultimately producing a sugar of good keeping quality. The efficiency of "carbrox" is stated to increase the more frequently it is used, owing to the fact that revivification by treatment with sodium hydroxide dissolves out a further portion of the silicious skeleton, exposing a further area for decolorising purposes. It is not necessary to use "carbrox" in acid solution, as in the case of most of the vegetable carbons, so that clarified filtered juice may be treated directly.—J. P. O.

Bagasse furnace design and control [in the cane sugar factory]. A. Gartley. Int. Sugar J., 1919, 21, 232–236.

In burning bagasse as fuel in the cane sugar factory, an effort should be made during milling to produce a material having as low a water content as possible; at present 35% would appear to be the lowest attainable limit. The furnace should be so designed that the water in the fuel can be evaporated at least partially before reaching the grate upon which it is burned, while care should be taken to distribute the bagasse evenly over the grate in order to avoid the formation of air holes. There is a limit to the size of grate which can be operated efficiently and uniformly covered, and also apparently to the amount of air which can be admitted through the grate without blowing the fine bagasse off the bars, thus destroying the fuel bed. Not more than 50% of air in excess of what is required for complete combustion should be employed.—J. P. O.

Starch; Composition of —. Precipitation by colloidal iron and by iodine and electrolytes. J. Mellanby. Biochem. J., 1919, 13, 28–36.

AMYLOGRANULOSE may be divided into three fractions, amylogranulose α , β , and γ , according to their behaviour with colloidal iron. Starch in solution is negatively charged. Starch reacts chemically with iodine, but the starch iodide formed may carry down further amounts of iodine in the adsorbed condition. (See further J. Chem. Soc., June, 1919.)—J. C. D.

PATENTS.

Bagasse; Apparatus for macerating —. W. S. Herriot, Glasgow. From N. Deerr, Brooklyn, N.Y., U.S.A. Eng. Pat. 126,093, 27.2.18. (Appl. 3471/18.)

The apparatus consists essentially of two sets of drums, an upper pair in which a stationary unperforated drum with a longitudinal opening is encased by a rotary perforated drum, and a lower pair in which a rotary perforated drum is encased in a stationary unperforated drum with a longitudinal opening. In each set the only communication through the pair of drums is through the perforations which are brought opposite to the longitudinal openings as the rotary drum revolves. Bagasse from the mill rollers is supplied to the drums, driven in opposite directions, and is brought into contact with water or dilute sugar cane juice under pressure, and then delivered on to a blanket which carries it to the next rollers. A series of such sets of drums is operated on the counter-current system, the strongest juice being supplied to the first set and water to the last set.—S. S. A.

Adhesive [from starch] and process for making the same. J. B. B. Stryker, Lansdale, Pa., Assignor to Perkins Glue Co. U.S. Pat. 1,299,809, 8.4.19. Appl., 18.7.17.

Root starch having a viscosity of less than 150 at 20 to 1 and over 18 at 9 to 1, is mixed in excess

with a degenerated starch having a viscosity of less than 80 and above 18 at 9 to 1, and with a quantity of water equal to 3 to 6 times the total weight of starch. The mixture is treated with caustic alkali to form a homogeneous colloidal adhesive which can be spread by the machinery ordinarily used for glue and will flow through pipes of 2 in. diameter.—S. S. A.

Extracting sugar etc. Eng. Pat. 126,262. See XII.

XVIII.—FERMENTATION INDUSTRIES.

Formaldehyde; Supposed diastatic properties of —. H. Sallinger. Ber., 1919, 52, 651–656. (Compare Woker, this J., 1916, 1268.)

THE author considers that the only valid methods of examining the supposed diastatic properties of formaldehyde towards starch consist in observations of the optical activity of the starch solutions and of their reducing power towards Fehling's solution. With regard to the first point, a solution of amylopectin (Lintner) was found to retain its optical activity unchanged after digestion with formaldehyde during 44 hours at 5° C. With regard to the second point, a solution of soluble starch (Wolf-Fernbach), after treatment with formaldehyde and removal of the latter as completely as possible, only showed slight reducing power towards Fehling's solution, attributable to traces of residual formaldehyde. Further, in a comparative series of experiments in which formaldehyde solutions of differing concentration were mixed with starch solution and water respectively and subsequently treated with Fehling's solution, a greater reduction was not found in any instance in the solutions containing starch than in those from which it was absent. The author therefore considers formaldehyde to be enzymatically indifferent to starch.—H. W.

Mineral [ammonium] salts; Use of — in brewing.

C. Schweizer. Schweiz. Chem.-Zeit., 1919, 1, 5–7. THE use of light worts in the brewing of beer tends to cause flocculation of part of the yeast before the fermentation is complete, with the result that subsequent fermentations with this immature yeast are still more unsatisfactory. In experiments to determine whether ammonium salts could replace the deficiency of nutriment in light worts comparative fermentations were carried out with 2 litres of wort (8% extract) to which quantities of 0.1 to 0.4 gm. of an ammonium salt and 10 c.c. of yeast were added. After 8 days the wort to which the salt had not been added had attenuated to 2.93% extract and had a head of 32 c.c. of yeast, whilst that containing 0.3 gm. of ammonium salt had attenuated to 3.3% extract and had a head of 43 c.c. In similar experiments with 0.4 gm. of ammonium salt the extract was 3.4% and the head of yeast 30 c.c., as compared with an extract of 4% and 22 c.c. of yeast in the blank test. The amount of ammonium salt added must not exceed 0.1 gm. to 2 litres to prevent a slight saline taste in the beer, but an experiment cited in which that proportion of the salt was used showed no appreciable difference in the degree of attenuation or the development of the yeast with or without the addition.—C. A. M.

Yeast; Utilisation of —. K. Schweizer. Schweiz. Chem.-Zeit., 1919, 1, 33–36, 69–72.

In breweries about 5 kilos. of waste yeast (about 1½ kilos. of dry yeast) is obtained by the use of 100 kilos. of malt, whilst in the nutrient yeast factories 60 kilos. of dried yeast is obtained by the use of 100 kilos. of sugar. If the yeast is not to be

used at once it is necessary to reduce its water content to 10 to 20%. For this purpose the pressed yeast (containing about 70% of water) is mixed with water to a thin paste, in which is made to rotate a hollow drum with internal steam heating. The layer of yeast withdrawn at each revolution is dried on the surface and removed by means of a scraper, and is finally ground to a fine powder. In the case of beer yeast a preliminary treatment with dilute alkali is necessary to remove the bitterness due to the hops. Dried yeast prepared in this way contains about 53% of albumin, 3% of fat and 27% of carbohydrates, and has a nutrient value of about 3500 cal. per kilo. For the preparation of a nutrient meal fermenting yeast is treated with 2% of an organic solvent (such as ether, benzene, or glycerin) or of salts (sodium chloride or carbonate) and, when liquefied, it is heated to 70°–80° C., mixed with starch or flour and, after hydrolysis of the starch, the mixture is converted into a powder. An aromatic yeast condiment is made by roasting pressed yeast at about 60° C. until the water is reduced to about 30%, and then closing the air-regulators of the apparatus and completing the roasting at 100° C. A fluid condiment is obtained by mixing pressed yeast with about 10% of sodium chloride and leaving the mass for some hours in a cool cellar and then for 3 hours at 50° C., after which it is boiled with water and pressed, and the liquid concentrated and filtered. Lindner's process of obtaining fat by cultivating *Endomyces vernalis* on a nutrient medium of dilute molasses and mineral salts yielded a yellow oil-cake containing about 18% of fat, 31% of proteins, and 43% of carbohydrates. The oil was suitable for food and yielded a hard soap. Yeast preparations are extensively used for the medicinal treatment of digestive troubles, and in diseases of the skin, eyes, etc. As the vitamins are not destroyed by a short heating at 100° C., the yeast, after being killed, is used as a remedy for beri-beri, rickets, etc. Plastic masses are made by treating waste yeast with formaldehyde, and drying and grinding the mixture, with or without the addition of tar, tar oils, sulphur, pigments, etc. It is then compressed in moulds at 90° C. or above, and under a pressure of at least 200 atmos. The product which is termed "ernolith" can be used as a substitute for bakelite, celluloid, etc.—C. A. M.

Enzymes; Oxidising —. Nature of the "peroxide" naturally associated with certain direct oxidising systems in plants. M. W. Onslow. *Biochem. J.*, 1919, 13, 1–9.

The direct oxidase system in the pear fruit or potato tuber is due to the presence of a peroxidase (which gives a blue colour with gualacum only on the addition of a peroxide) and an aromatic substance giving the characteristic reactions of the catechol grouping. On injury of the tissues, the peroxidase activates the oxidation of the aromatic substance with the formation of a peroxide. The peroxide-peroxidase system so formed is then able to produce the blue colour with gualacum. (See further *J. Chem. Soc.*, July, 1919.)—J. C. D.

Alcohol-water mixtures; Determination of the freezing point curves and densities of denatured —. C. E. Davis and M. T. Harvey. *J. Ind. Eng. Chem.*, 1919, 11, 443–448.

The freezing points of denatured alcohol-water mixtures were determined by measuring the electrical resistance and observing, by a series of readings at slowly increasing temperatures, the break in the curve which indicates the change from the solid to the liquid phase. The denatured alcohol consisted of ethyl alcohol, 100, methyl alcohol, 10, benzoline, 0.5 vols. The following freezing points are selected from those recorded for various mixtures contain-

ing different proportions of the denatured alcohol: 5%, –2.8°; 10%, –4.0°; 15%, –6°; 20%, –8.5°; 25%, –11.5°; 30%, –14.8°; 40%, –22.1°; 50%, –31.1°; 60%, –38.9°; 70%, –43.6°; 80%, –53.7°; 90%, –73.7° C. The sp. gr. of these mixtures is also given.—W. P. S.

Yoghurt. O. Laxa. *Ber. Lactol. Anstalt K.K. Böhm. Techn. Hochschule in Prag*, 1918. *Chem. Zentr.*, 1919, 90, II., 432–433.

A PURE culture from native Bulgarian "Maya" has been cultivated for three years without renewal. It produces an excellent yoghurt and thickens milk in 2–2½ hours. The best results are obtained by using milk sterilised while quite fresh, otherwise decomposition products are formed which soon cause a weakening of the culture. The length of life of the culture depends upon the prevailing temperature and upon the proportions of the different micro-organisms. The observation of Pavlák, that the presence of *Saccharomyces (Torula)* lengthens the life of the culture has been confirmed, although their presence is not necessary for the production of good yoghurt, and moreover they impart an unpleasant yeasty flavour. The following defects are noted: Weakening of the acid-forming power of the culture as a result of cultivation at higher temperatures; decrease in coagulating power as a result of over-acidification; separation of whey; over-acidification; bitter flavour; yeasty flavour; separation of flocculent precipitate; formation of gas.—L. A. C.

Yeast in tan liquors. Asai. See XV.

Action of cold on micro-organisms. Ruata. See XIXa.

Bac. coli. Wyeth. See XIXb.

PATENT.

Pressed yeast; Continuous process of obtaining vigorous —. A. Wohl and S. Scherdel, Danzig-Langfuhr. *Ger. Pat.* 310,580, 16.1.15.

By replacing about 10 to 15% of the organic nitrogen in the culture medium by ammoniacal nitrogen, yeast may be cultivated for several successive generations without any material depreciation in its reproductive or fermentative powers. This is not possible by the use of ammonium-salts as the only source of nitrogen. If the proportion of ammonium salts used be added in two or more fractions the resulting yeast can be pressed more readily.

—C. A. M.

XIXA.—FOODS.

Milk; Electrical conductivity of —. J. H. Coste and E. T. Shelbourn. *Analyst*, 1919, 44, 158–164.

THE temperature coefficient of the electrical conductivity of milk in the region of 15° C. is 0.000093, or about 2.3% of the total conductivity: this agrees fairly with the normal value of 0.026K for neutral salts. The conductivity of presumed genuine milks may vary from $K_{25} = 0.0035$ to 0.0047, but is usually between 0.0040 and 0.0042. It increases, up to a certain point, with increase of acidity, but, owing to the lessened dissociation of the acids formed as their concentration increases, it reaches an almost constant value, whilst the amount of acid is increasing. There is no correlation between conductivity and total solids or total ash, but there is a marked correlation between the

conductivity and chlorine content of milk. The specific conductivity of a mixture of milk and water decreases with increasing dilution, but the specific conductivity of the milk in the solution increases considerably as the dilution becomes greater, probably owing to dissociation of phosphates and citrates. The electrical conductivity of milk is not sufficiently well defined to make the determination generally useful for the detection of added water in milk.—W. P. S.

Citric acid in milk; Determination of —. R. Kunz. Arch. Chem. u. Mikroskop., 1915, [4]. Chem. Zentr., 1919, 90, II., 279—280.

The following method is based upon the results previously described (this J., 1915, 974): Fifty c.c. of the milk is shaken with 10 c.c. of sulphuric acid (1:1), and after the addition of 2 c.c. of 40% potassium bromide solution and 20 c.c. of phosphotungstic acid solution (120 grms. sodium phosphate and 200 grms. of sodium tungstate dissolved in 1 litre of water and treated with 100 c.c. of sulphuric acid [1:3]), the liquid is made up to 200 c.c. and filtered. 150 c.c. of the filtrate is heated for 5 mins. to 48° to 50° C., with 25 c.c. of freshly saturated bromine water, and then treated slowly with 10 c.c. of 5% potassium permanganate solution, and the remainder of the determination effected as previously described (*loc. cit.*). In calculating the amount of pentabromo-acetone into citric acid it is necessary to allow 37 c.c. for the volume of the precipitate. The weight of pentabromo-acetone multiplied by 1.215 gives the amount of citric acid + 1 mol. H₂O in 100 c.c. of the milk. The amounts present in milk from the same cow rose from 0.1980 grm. to 0.1992 grm. and then fell to 0.1806 grm. per 100 c.c. during the course of milking. On standing, and especially when it becomes sour, milk shows a pronounced decrease in its citric acid content (*e.g.* from 0.1707 grm. to 0.1206 grm. per 100 c.c. in 24 hours, and to 0 in 48 hours). This decrease is due to bacterial action and may be practically inhibited by adding 1 c.c. of toluene to the milk.

—C. A. M.

Butter; Relation between the Kirschner, Reichert-Meissl, and Polenske values of —. H. D. Richmond. Analyst, 1919, 44, 166—167.

Bolton and Revis (this J., 1912, 553) and Cranfield (*ibid.*, 1915, 1109) have shown that there is a relation between the Kirschner value (*K*) and the Polenske value (*P*) of butter. The author finds that the formula $P = 0.26 (K - 14)$ gives results agreeing with the mean figures; coconut oil is certainly present if the Polenske value is greater than 0.26 (*K* - 10). From the results of over 100 experiments it is found that the relation between the Reichert-Meissl value (*R*) and the Polenske value (*P*) may be expressed approximately by the formula $R \times 0.033 - 0.6155 = \log. 10(P - 0.48)$.—W. P. S.

Casein. L. A. Maynard. J. Phys. Chem., 1919, 23, 145—153.

Digestion of casein at 25° C. with 1% sodium hydroxide converts the whole of the phosphorus and sulphur into a soluble inorganic form. The addition of acids to the product precipitates a white substance which in many of its properties is very like casein, but in some, especially its solubility in different reagents, is quite different. The white colour of milk is shown to be due in all probability to the peptisation of calcium phosphate by the colloids present in the milk. (See also J. Chem. Soc., July, 1919.)—J. F. S.

Cacao products; Detection of excess of shell in —. K. Hoepner. Z. Unters. Nahr. Genussm., 1919, 37, 18—31.

If the crude fibre content exceeds 6.0%, the iron oxide 0.1%, and the acid-insoluble ash 0.5%, all calculated on the dry, fat-free, and sugar-free substance, the cacao product under examination contains an excess of shell. For example, if a sample contains 10.1% of crude fibre, the difference between this and 6% is multiplied by 10 to obtain the actual excess of shell present; in this case it will be 41%. A microscopical examination will often indicate the presence of an unusual amount of shell.—W. P. S.

"Brick tea," tea tablets, tea extracts, etc. Utz. Ber. deuts. Pharm. Ges., 1919, 29, 5—24.

ANALYSES are given of brick tea, tea tablets, tea extracts, mate tablets, etc. Brick tea is prepared by compressing tea offal (broken leaves, stalks, etc.) and its composition does not differ greatly from that of ordinary tea. A sample of a dry tea extract examined contained: Moisture, 7.25; ash, 9.45; caffeine, 6.67; tannin, 28.86%. Other samples contained added sugar and milk.—W. P. S.

Antiscorbutic factor; Role of — in nutrition. J. C. Drummond. Biochem. J., 1919, 13, 77—80.

AN adequate supply of the antiscorbutic vitamin is necessary for the growth and well-being of the higher animals.—J. C. D.

Vitamine; Fat-soluble —, its nature and properties. J. C. Drummond. Biochem. J., 1919, 13, 81—94.

THE vitamin present in certain oils and fats, as for example butter and whale oil, is relatively thermostable. It may be destroyed by prolonged exposure to temperatures as low as 37° C. Destruction is rapid at 100° C., and does not appear to be due to oxidation or hydrolysis. The vitamin could not be separated in a pure state, and it has not been identified with any known constituent of the oils examined. (See further, J. Chem. Soc., July, 1919.)—J. C. D.

Vitamine; Role of the fat-soluble — in nutrition and its influence on fat metabolism. J. C. Drummond. Biochem. J., 1919, 13, 95—102.

THIS vitamin is necessary for the adult as well as for the growing child. No direct relationship of the accessory factor to fat metabolism could be traced. (See further, J. Chem. Soc., July, 1919.)—J. C. D.

Straw; Value of digested — as a fodder. F. Hansen. Biedermann's Zentr., 1919, 48, 110—117.

THE author gives his experience with an experimental plant for treating straw by the Colman process of digestion with sodium hydroxide. Analyses of the straw before and after treatment are given. The washing may be responsible for a considerable loss of certain food components. Apparently the value of the process lies chiefly in the higher starch value which the final product possesses. The prepared straw was well absorbed by cows, and milk production was satisfactory. It may be of the greatest service in feeding horses, but its value for pigs is hypothetical.—J. C. D.

Straw digested with hydrochloric acid; Food value of —. F. Hansen. Biedermann's Zentr., 1919, 48, 118—121.

ANALYSES of the treated straw and estimations of the food components present are given. Feeding tests

with cows indicate that the nutritive value of straw prepared by the hydrochloric acid process is not as high as that of good chaff. The process is not as valuable as the Colman process of digestion with sodium hydroxide. (See preceding abstract.)

—J. C. D.

Prune kernels. Fordyce and Torrance. See XII.

Fatty residues from Gerber process. Relss. See XII.

White beet and cane sugars. Prinsen Geerligs. See XVII.

Utilisation of yeast. Schweizer. See XVIII.

Yoghurt. Laxa. See XVIII.

Action of cold on micro-organisms. Ruata. See XIXB.

PATENTS.

Milk food products and methods of making same. C. S. Stevens, Sheboygan, and C. A. Baumann, Jefferson, Wis., U.S.A. Eng. Pat. 125,172, 3.8.17. (Appl. 11,263/17.)

SKIMMED milk at 60° C. is mixed with coconut oil at 32° C. by the aid of superheated steam introduced by jets into the body of the mixture. When the temperature of the mixture has been raised to 100° C., emulsification is complete. The emulsion is evaporated to the consistence of cream in vacuum pans with agitation, passed through a homogeniser, and rapidly cooled to 4° C. It is then filled into tins and sterilised for an hour at 100°–126° C. Immediately after the conclusion of the sterilising process, the tins are placed in a mechanical shaker for 5 mins. to prevent the formation of a jelly.

—J. H. J.

Artificial milk; Manufacture of —. K. Erslev, Nijmegen, Holland. U.S. Pat. 1,297,668, 18.3.19. Appl., 3.1.19.

COMMUNITED vegetable matter containing protein, fat, sugar, and lecithin is extracted with a fat-solvent to remove all fat, and also with a solvent for lecithin and sugar, e.g., alcohol. The residue is extracted with an alkali to dissolve protein. The alcoholic extract is purified to remove bitter principles, and the residue containing lecithin and sugars added to the foregoing alkaline solution. The fatty material is purified to remove disagreeable flavours, and the whole or part of it added to the mixture of alkaline solution and alcoholic extract.—J. H. J.

Pectous substances; Production of —. B. T. P. Barker, Long Ashton, Somerset. Eng. Pat. 125,330, 14.11.18. (Appl. 18,668/18.)

VEGETABLE tissues containing pectous substances, e.g., apple residues from cider manufacture, are disintegrated and washed with water to remove acids. The pulp is then treated with steam at 60 lb. pressure in order to render the pectous substances soluble; these are then extracted with water and the extract concentrated if necessary. The extract may be stored under sterile conditions, or sugar may be added as a preservative without causing the extract to set. The use of the extract in the preparation of jam from fruits which are poor in pectous substances leads to the formation of a good jelly. (See also this J., 1918, 243 r.)—J. H. J.

Lupin seeds; Removal of the bitter and poisonous constituents of —. L. Sarason, Charlottenburg. Ger. Pat. 299,686, 7.5.15.

THE bitter and poisonous constituents of lupin seeds are removed by soaking the seeds, in the pods if desired, in a stream of acidified water through which an electric current is passed. The food value of the seeds is also increased by this treatment.

—L. A. C.

Dehydrating; Apparatus for —. Process of and apparatus for preparing potatoes for dehydration. M. F. Mangelsdorff, Union Hill, N.J., Assignor to H. Rentz, Montclair, N.J. U.S. Pats. 1,299,492 and 1,299,493, 8.4.19. Appl., 15.11 and 14.12.17. SEE Eng. Pats. 120,501 and 121,405 of 1918; this J., 1919, 2 A, 89 A.

XIXB.—WATER PURIFICATION; SANITATION.

Ammonia; Test for albuminoid —. E. A. Cooper and J. A. Heward. Biochem. J., 1919, 13, 25–27.

HIGH values for albuminoid ammonia in samples of water of high standard cast suspicion upon the purity of the reagents employed. Potassium permanganate may contain a nitrogenous impurity which cannot as a rule be removed by boiling with alkali. The impurity appears to be slowly decomposed with the evolution of ammonia when the permanganate-alkali reagent is boiled in the diluted condition, but it is practically impossible to purify the reagent by this method. The error introduced may be very serious and sufficiently great to vitiate the value of the test altogether. The presence of this oxidisable impurity may be one explanation of the observed decomposition of about 5% of the permanganate in the control distilled water test carried out in the determination of the oxygen absorbed in 4 hours at 27° C. The importance of testing the reagents is emphasised.—J. C. D.

Bacillus coli; Effects of acids, alkalis, and sugars on growth and indole formation of —. F. J. S. Wyeth. Biochem. J., 1919, 13, 10–24. (See also this J., 1919, 197 A.)

DETAILS are given of the influence of the initial reaction of the medium upon the growth and activities of *B. coli*. The approximate limits of initial reaction are P_H 4.27–9.87. The final reaction is dependent upon the initial reaction and composition of the medium. Fermentation in a glucose-peptone medium results in formation of acid and the proteolytic activities of the organism are inhibited. In a peptone medium the proteolytic action results in the formation of acids and ammonia. Indole formation is inhibited by the presence of free acid or alkali and certain sugars. (See further, J. Chem. Soc., July, 1919.)—J. C. D.

Micro-organisms; Action of cold on —. G. Q. Ruata. Riv. del Freddo, 1913, 4, 120–126. Bull. Agric. Intell., 1919, 10, 116–117.

FACTS observed in the application of artificial cold in the cold-storage industry are opposed to the commonly accepted theory that the micro-organisms which attack food materials are not destroyed when subjected to low temperatures, although their development is suspended. Experiments were therefore made in which the influence of refrigerating temperatures (–3° to –12° C.) upon the organisms was studied in a dry environment. The growth of *B. coli* was retarded, and the action of the cold was progressively germicidal, the culture showing signs of destruction in 4 to 6 days, and

being completely destroyed in 115 to 120 days. *B. pyocyaneus* was also progressively destroyed, but the formation of pigment was unaffected so long as traces of vitality remained. The power of this organism to liquefy gelatin was inhibited by prolonged cold, whilst this property of *Staphylococcus pyogenes aureus* was progressively delayed, but not destroyed, as was also the case with its hæmolytic capacity. The liquefying power of *B. proteus vulgaris* was destroyed by cold, but no modification was observed in the course of six months' exposure in the power of this organism and that of *B. bulgaricus* to coagulate milk. The amylolytic power of *B. clavatus*, Biff., was completely destroyed by the prolonged action of cold, and the spores of this organism, which are among the most resistant known, were gradually destroyed. The cholera vibrio offered but little resistance to cold, but its agglutinating power was not affected while it remained alive. Analogous results were obtained in experiments on the vitality of organisms isolated from putrefying meat, including *B. fluorescens non liquefaciens*, *B. coliformis*, a liquefying *Streptococcus* which coagulated milk, *B. prodigiosus*, and *B. proteus vulgaris*.—C. A. M.

Filter for smokes and bacteria; Portable electrical — A. B. Lamb, G. L. Wendt, and R. E. Wilson. Amer. Electro-Chem. Soc., Apr., 1919. (Advance copy.) 9 pages.

AN apparatus in which very finely divided particles in suspension in air, such as occur in smoke attacks in war, could be removed by means of an electric discharge was constructed of four glass tubes, 1.5 cm. in diameter and 12 cm. long, each wrapped in a strip of copper gauze. Down the centre of each tube was passed a spiral of fine copper gauze cut from a piece of copper wire cloth and including only two long strands with the cross strands cut short. The ends of the long strands of the spiral were insulated from the outer wire gauze. Current was supplied from an induction coil worked from a small lead storage battery furnishing $\frac{1}{2}$ ampère at 6 volts. The apparatus was tested by passing air containing fumes of ammonium chloride through it at the rate of 5 litres per min., when all the ammonium chloride was removed. Air charged with bacteria had all the bacteria removed and also killed by the apparatus.—J. H. J.

Gas-mask absorbents. A. B. Lamb, R. E. Wilson, and N. K. Chaney. J. Ind. Eng. Chem., 1919, 11, 420—438.

THE absorbent used in the British and American gas-mask canisters consisted of a mixture of charcoal and soda-lime. That in the American canisters consisted of coconut shell charcoal (6- to 14-mesh), 60, and soda-lime-permanganate granules (8- to 14-mesh), 40%. Another mixture, claimed to be better, consisted of specially impregnated coconut charcoal, 75, and soda-lime, 25%. The authors describe the properties required in a charcoal intended to be used for the purpose and methods for its preparation. Investigation showed that a mixture containing sodium hydroxide, 4, kieselguhr, 4, moisture, 12% and the remainder lime, would be a hard and efficient absorber for practically all industrial gases.—W. P. S.

Formaldehyde; Disinfection with —. Practical efficiency of some substitutes for the permanganate-formalin method. M. A. Pozen and L. V. Dieter. J. Ind. Eng. Chem., 1919, 11, 448—451.

THE chlorinated lime-formalin method (see this J., 1918, 191 A) was found to be the most practical

method for the routine disinfection of rooms. The comparison was made with the sodium chlorate-formalin, lime-sulphuric acid-formalin, and permanganate-formalin methods.—W. P. S.

Volatile substances; Comparative toxic action of certain — on different insects. G. Bertrand and M. Rosenblatt. Comptes rend., 1919, 168, 911—913.

USING the method previously described (this J., 1919, 336 A) the authors have examined the toxic effect of a number of substances coming under the heading of anesthetics, lachrymators, and lachrymators and suffocants, respectively. The substances examined may be arranged in ascending order of toxicity as follows:—ether, chloroform, carbon bisulphide, carbon tetrachloride, benzyl bromide, monochloroacetone, hydrocyanic acid, and chloropicrin. There is no marked difference for a given substance in its toxicity towards different species of insects.—W. G.

Treatment of anthrax. Gegenbauer. See XV.

Opacimeter. Lambert and others. See XXIII.

PATENTS.

Centrifugal separators [for purification of water]. R. A. Sturgeon, Portsmouth. Eng. Pat. 125,502, 16.4.18. (Appl. 6408/18.)

A DRUM in the form of a truncated cone is mounted on a rotary vertical spindle, the bottom of the drum being closed by a plate mounted on the spindle. Inside the drum a tube mounted on the spindle carries a series of horizontal flexible discs, alternate discs not reaching to the sides of the drum and intermediate ones having apertures near the tube. Water to be treated enters at the top of the drum, passes between the discs, and escapes at the bottom. A solution of a coagulant is introduced through the tube, which has openings opposite the spaces between the discs. For cleaning purposes the machine is stopped, the bottom of the drum and the discs are lowered slightly, so that a clear space is left down the sides of the drum, and a flush of water is passed through.—J. H. J.

Ozonising substances; Process of —. A. J. Moisant, New York, Assignor to General Research Laboratories. U.S. Pat. 1,297,716, 18.3.19. Appl., 4.8.16. Renewed 7.6.18.

LIQUID to be ozonised is introduced in a finely divided state into a stream of gas under pressure, containing ozone, and the mixture thus formed is forced through an apparatus, so as to break it up into finely divided particles. The mixture is allowed to expand into a closed chamber to a pressure greater than atmospheric, then mixed with a further quantity of gas containing ozone, and finally expanded to atmospheric pressure.—B. N.

Water; Heating of boiler feed — [on steamships] and its treatment [de-aeration] with a view to preventing corrosion in the boilers. G. and J. Weir, Ltd., and W. Weir, Glasgow. Eng. Pat. 126,014, 24.10.16. (Appl. 15,084/16.)

Waste liquors. Ger. Pat. 309,406. See V.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Morphine; Diazo-reaction of — L. Lautenschläger. Arch. Pharm., 1919, 287, 13—18.

MORPHINE and its salts couple with diazonium compounds in alkaline solution to yield dyes, the most suitable reagent being diazobenzenesulphonic acid. For qualitative work, an approximately 2% aqueous solution of the latter is added to the solution of the morphine salt, which is then made alkaline with sodium carbonate or bicarbonate; a deep-red to pale-red coloration, according to the concentration of the alkaloid, is immediately developed which becomes orange after acidification with dilute acid. The limit of sensitiveness for the alkaline solution is less than 1 in 10,000. The dye has little affinity for fibres in an acid bath. Morphine is the only member of the opium alkaloids which yields a true dye with diazonium compounds; its synthetic derivatives (dionin, heroin, peronin) do not give the reaction whilst, of the commoner pharmacological alkaloids only a few (emetine, sparteine, physostigmine, piperidine, coniline, nicotine) give dyes. The reaction can be used for the toxicological detection of morphine in the presence of its substitutes and of other alkaloids. For quantitative purposes, a definite volume of the morphine solution is treated with 1 c.c. of a freshly prepared solution of diazobenzenesulphonic acid (3 grms.) in water (100 c.c.) and 10 c.c. of concentrated sodium carbonate solution; the intensity of the coloration is compared with that given by morphine solutions of known alkaloidal content. The most suitable concentration of morphine is 0.5–0.05 mgrm. per c.c. The results are not affected by the presence of other opium alkaloids. The method can also be applied to the estimation of the morphine content of ripe poppy heads and the results agree well with those determined by the iodine acid process. (See also J. Chem. Soc., July, 1919.)—H. W.

Morphine and cocaine; Resistance of — to putrefaction. L. P. J. Palet. Anal. Soc. Quím. Argentina, 1919, 7, 22—26.

Two cases are described in which the presence of morphine in the viscera was demonstrated seven months and two years and six months respectively after death. In the former case cocaine or its decomposition products were also detected. As a test for the presence of morphine the following procedure is recommended: 100–120 grms. of the visceral pulp is warmed at 50°–60° C. with 100 c.c. of water and 5 c.c. of sulphuric acid (1:4) for two hours. The liquid assumes a blood-red colour which is especially marked on filter paper.

—W. S. M.

Digitalis purpurea. G. P. Koch and J. R. Butler. Amer. J. Pharm., 1919, 91, 211—221.

THE variation in the viability of digitalis seeds, which with different samples ranged from 7.5–91% viable, was successfully determined by allowing the seeds to germinate between moistened blotting paper for about 9 days. Inorganic fertilisers applied to a clay loam soil were effective in increasing the yield of digitalis, a fertiliser containing CaCO_3 , 1000; $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$, 800; K_2SO_4 , 400; NaNO_3 , 600; MgSO_4 , 100 parts giving the best results. Sodium nitrate seemed to be the most essential single fertiliser for this type of soil, and calcium phosphate in sand. Neither ferrous nor manganese sulphates encouraged a larger growth of digitalis, but 150 lb. of the latter per acre increased the activity of the digitalis by 17%. Digitalis

leaves are best either dried at 100° C., or heated at 100° C. for an hour, and then dried at 55°–60° C. The activity is diminished by drying entirely at the lower temperature.—G. F. M.

Hydrastis canadensis; Rhizome of — E. Belloni. Boll. Chim. Farm., 1919, 58, 81—91.

COMMERCIAL samples of *Hydrastis canadensis* contained from 48 to 71.4% of rhizome and from 2.7 to 5.8% of leaves, stalks, etc., whilst the rootlets accompanying the rhizomes varied from 2.5 to 52%. The moisture ranged from 10 to 14.87%, and did not differ materially in the rhizomes and the rootlets, whilst the ash varied from 3.78 to 6.03% in the rhizomes and from 7.31 to 10.5% in the rootlets. The amount of hydrastine in the commercial drug varied from 2.97 to 3.45%, the rhizomes containing 3.55 to 3.93% and the rootlets 2.30 to 2.96%. The method of Dichgans (this J., 1914, 1025) was found the most suitable for determination of the hydrastine. The rhizomes contained from 2.45 to 3.35% of berberine determined by Gordin's method (this J., 1902, 142).—C. A. M.

Linamarin and glycollonitrilecelloside; Syntheses of — E. Fischer and G. Anger. Ber., 1919, 52, 854—868.

THE synthesis of linamarin has been effected on lines similar to those followed by Fischer and Bergmann (this J., 1917, 1288) in the syntheses of mandelonitrileglucoside and sambunigrin. Ethyl tetra-acetylglucosido- α -hydroxyisobutyrate* is prepared from acetobromoglucose, ethyl α -hydroxyisobutyrate, and dry silver oxide and is converted successively into glucosido- α -hydroxyisobutyramide, tetra-acetylglucosido- α -hydroxyisobutyramide, and tetra-acetyl linamarin; the latter, when de-acetylated, yields linamarin, $\text{C}_9\text{H}_{17}\text{O}_5 \cdot \text{O} \cdot \text{C}(\text{CH}_3)_2 \cdot \text{CN}$, colourless needles, m.pt. 142°–143° C. (corr.). $[\alpha]_D^{18} = +29.1^\circ$ in water. Except for the somewhat higher specific rotation, the synthetic glucoside is identical with the natural linamarin isolated by Jorissen and Hairs (Bull. Acad. Belg., 1891, [3], 21, 529) from flax seed and with phaseolunatin obtained by Dunstan and Henry from *Phaseolus lunatus* (this J., 1903, 1255). The synthetic, like the natural glucoside, is slowly hydrolysed by emulsin, more rapidly by phaseolunatin. It appears to be a β -glucoside. Since amygdalin, the most important member of the cyanogenetic glucosides appears to be the derivative of a disaccharide, the authors have attempted the synthesis of a similar substance in the manner adopted for linamarin. Thus, ethyl hepta-acetylcellosidoglycollate, $(\text{C}_6\text{H}_5\text{O})_2\text{C}_1\text{H}_2\text{O}_4 \cdot \text{O} \cdot \text{CH}_2\text{CO}_2\text{C}_2\text{H}_5$, is prepared from acetobromocellulose, ethyl glycollate and dry silver oxide and is transformed successively into cellosidoglycollamide, hepta-acetylcellosidoglycollamide, hepta-acetylcellosidoglycollonitrile, and cellosidoglycollonitrile, $\text{CN} \cdot \text{CH}_2 \cdot \text{O} \cdot \text{C}_{12}\text{H}_{21}\text{O}_{16}$; the latter could not be obtained in the crystalline state but appears to have been prepared in an almost pure state, since, on re-acetylation, it gave the original hepta-acetyl compound in good yield. It had $[\alpha]_D^{18} = -28.7^\circ$ in water. It was comparatively easily hydrolysed by emulsin yielding hydrocyanic acid and dextrose. (See also J. Chem. Soc., 1919, 1, 256.)—H. W.

Organic bases; Tungstic and molybdic complexes as precipitants of — L. Gugliemelli. Anal. Soc. Quím. Argentina, 1918, 6, 57—64.

THE reagents were prepared by dissolving the sodium salt of the following acids in dilute hydrochloric acid: tungstic, arseno-, silico-, and phospho-tungstic, molybdic, arseno- and phospho-molybdic.

arsenotungstomolybdic, and arsenovanadotungstic. The reactions given by these precipitants with dilute hydrochloric acid solutions of the following organic bases are tabulated: α - and β -naphthylamine, benzidine, antipyrine, pyrimidone (dimethylaminoantipyrine), caffeine, pyridine, nicotine, quinoline, cinchonine, cocaine, and auramine. (See also this J., 1919, 55 A.)—W. S. M.

Antitoxin and its associated proteins; Separation of — from heat-denatured sera. A. Homer. *Biochem. J.*, 1919, 13, 45–55.

For complete recovery of antitoxin during the concentration of sera, showing a heat-denaturation of 35% or less, by fractional methods employing the use of ammonium sulphate, it is advisable to precipitate the second fraction between 30 and 45% of saturation with the salt. The lower limit of saturation should be raised to 33 or 36% in the precipitation of the second fraction from sera in which a denaturation of 25% or less has been induced. The bulk of the antitoxin is associated with the proteins precipitated between 36 and 45% of saturation with ammonium sulphate. The further fractionation of the protein precipitated between these limits indicated that the percentage of the total antitoxin precipitated between progressively increasing percentages of saturation with ammonium sulphate is directly proportional to the percentage precipitation of protein at the respective stages. For the complete recovery of antitoxin means other than the fractional precipitation of the serum proteins must be employed.

—J. C. D.

Antitoxin; Increased precipitability of pseudoglobulin and associated — from heat-denatured solutions. A. Homer. *Biochem. J.*, 1919, 13, 56–64.

The increased precipitability of pseudoglobulin from its heat-denatured solutions at concentrations of ammonium sulphate ranging from 26–47% of saturation is a function of the heat-denaturation. The increased precipitation of pseudoglobulin at 30% saturation with ammonium sulphate is accompanied by an increased precipitation of antitoxin. In the concentration of antitoxic sera by the fractional precipitation of the serum with ammonium sulphate, there is no need for a preliminary prolonged heating of the serums. The results now obtained by the isolation of the protein fraction precipitated from heated serum between 30 and 44% of saturation with ammonium sulphate could be obtained from the unheated serum between 36 and 50% of saturation. The heating reduces the toxicity of the cresylic acid-protein complex. In order to isolate antitoxin as a separate entity, means other than the fractional precipitation of pseudoglobulin solutions by salts must be employed. (See preceding abstract.)—J. C. D.

Pinene vapour; Action of finely divided metals on —. P. Sabatier, A. Mailhe, and G. Gaudion. *Comptes rend.*, 1919, 168, 926–930.

When pinene vapour is passed over finely divided copper, nickel, cobalt, or iron at 350° C. there is no evolution of gas, but a liquid is obtained, which is less volatile than the original pinene and consists of terpenes isomeric with pinene, and a small amount of polyterpenes. At higher temperatures the action is more complex and there is an evolution of a gas, the amount and composition of which varies with the temperature and the nature of the metallic catalyst used. With copper at 500° C. there is an abundant evolution of a gas, which is a mixture of hydrogen and ethylenic hydro-

carbons. If the temperature is raised to 600°–630° C., there is a still more marked evolution of gas, whilst the liquid product consists of a mixture of isoprene, ethylenic and diethylenic hydrocarbons, terpenes, and aromatic hydrocarbons such as toluene, *m*-xylene, cymene, cumene, and methyl-ethylbenzene. In a trial on a commercial scale with several tons of pinene using copper at 550° C. as a catalyst, the yield of aromatic hydrocarbons was about 21% of the pinene employed. With reduced nickel at 600° C. a very energetic decomposition of the pinene occurs, a gas being evolved which is rich in hydrogen. The catalyst quickly becomes covered with a carbonaceous deposit, but very little liquid product is obtained. Iron is about as effective as nickel, whilst the effect of cobalt as a catalyst is intermediate between those of copper and nickel.—W. G.

Menthol dissolved in eugenol and phenol; Optical activity and quantitative estimation of —. O. von Friedrichs. *Arch. Pharm.*, 1919, 257, 72–78.

Mixtures of menthol, eugenol, and phenol are used as local anaesthetics, particularly in dentistry, and a solution of menthol (40%), phenol (40%), and eugenol (20%) is described in the latest edition of the Swedish Pharmacopoeia under the name "tinctura antiodontalgica." For the estimation of the menthol content, the author has determined the specific rotation, at 18° C., of solutions of menthol in phenol ($p=25-50$), in eugenol ($p=10-50$), and in mixtures of phenol and eugenol (2:1, 1:1, and 1:2), and has derived formulæ by which the menthol content may be directly calculated from the optical activity.—H. W.

Alcohols; Isolation and characterisation of — as allophanates. A. Béhal. *Comptes rend.*, 1919, 168, 945–947.

The method of preparation of the allophanates consists in passing a current of cyanic acid gas through the alcohol, filtering off the product, washing it with ether and re-crystallising from absolute alcohol, benzene, or acetone. The alcohol is characterised by the m.pt. of its allophanate, which is then saponified and the physical constants of the resulting alcohol determined. The method is applicable to tertiary alcohols. The terpene alcohols, except linalool, and the cyclic alcohols, except terpinol, give normal allophanates. The presence of a phenolic group in a cyclic alcohol interferes with the reaction, and this group must first be esterified, when the reaction proceeds normally. Alcohols, either cyclic or acyclic, containing an ethinoid linking give normal allophanates.—W. G.

Carbonyl chloride; Estimation of traces of — in air. A. Kling and R. Schmutz. *Comptes rend.*, 1919, 168, 891–893.

Using the method previously described (see this J., 1919, 338 A) the carbonyl chloride may be estimated gravimetrically if the weight of diphenylurea exceeds 10 mgrms., by dissolving the precipitate off the filter with alcohol and evaporating the alcoholic extract in a weighed platinum dish at 60° C., the residue being dried at this temperature for two hours. Alternatively a colorimetric method may be employed, by digesting the precipitate and filter paper with sulphuric acid and mercuric sulphate and proceeding as in the ordinary Kjeldahl process, the ammonia passing over in the final distillation being collected in 25 c.c. of *N*/250 hydrochloric acid and estimated by means of Nessler's reagent.—W. G.

Extractions [of organic acids] with ether; Systematic — J. Pinnow. Z. Unters. Nahr. Genussm., 1919, 37, 49—65.

THE distribution coefficient of glycollic acid and formic acid between water and ether at 15° C. (32 for glycollic acid and 24 for formic acid) and at 26° C. (38 and 25, respectively) have been determined, and the extraction of succinic, oxalic, malic, and monoethylcitric acid from half-saturated solution has been investigated. Lactic acid and citric acid in half-saturated solution can be identified and determined by extraction and application of the distribution coefficients. A substance which is not readily extracted can be determined, without complete extraction, if a number of successive and similar extractions are made.—W. P. S.

Tannin and similar substances. Fischer and Bergmann. See XV.

Utilisation of yeast. Schweizer. See XVIII.

PATENTS.

Aldehydes; Manufacture of aromatic — G. Blanc, Paris. Eng. Pat. 115,244, 27.4.18. (Appl. 7119/18.) Int. Conv., 27.4.17.

AROMATIC aldehydes free from any trace of carboxylic acid are produced by boiling aromatic chloromethylene derivatives with an aqueous solution of an alkali bichromate, preferably with the addition of an alkali hydroxide or carbonate. $3R.CH_2Cl + Cr_2O_3.Na_2 + NaOH = 3NaCl + 3R.CHO + Cr_2O_3 + 2H_2O$. Thus a mixture of 41 parts of *p*-chloromethyltoluene, 30 of sodium bichromate and 6 of sodium carbonate in 150 parts of water on boiling under a reflux condenser for 20 hours gives a nearly quantitative yield of *p*-toluic aldehyde which is isolated from the reaction mixture by distillation in steam.—G. F. M.

Acetaldehyde; Manufacture of — J. Crosfield and Sons, Ltd., Warrington, and T. P. Hilditch, Grappenhall. Eng. Pat. 125,926, 25.4.19. (Appl. 3542/19.)

IN the production of acetaldehyde by passing acetylene into an aqueous solution (200 parts) containing mercuric oxide (2 parts), crystallised ferric sulphate (5 parts) and sulphuric acid (sp. gr. 1.84, 40 parts) at 60° C., the reaction slackens after about 2 hours in which 41 parts of acetaldehyde can be produced, because the mercuric salt becomes reduced to a mixture of mercurous sulphate and mercury; by the addition of 0.3 part by weight of hydrogen peroxide the mixture may be re-converted into mercuric sulphate and the passage of acetylene resumed. This treatment may be repeated several times until the total weight of acetaldehyde produced exceeds one hundred times the weight of the mercuric oxide taken, the whole operation occupying 15 hours; after this the accumulation of by-products renders the solution incapable of further satisfactory absorption of acetylene and the sludge is therefore removed, washed free from organic matter, and again oxidised.—D. F. T.

Playing-ball [; Use of lead alkyl sulphate in making — J. R. C. Schüpphaus, Brooklyn, N.Y. U.S. Pat. 1,298,410, 25.3.19. Appl., 30.6.15.

A BALL is constructed with a core composed of a mixture of a basic lead salt of an alkyl sulphuric acid, e.g., ethylsulphuric acid and water forming a stable homogeneous liquid of great density.

—D. F. T.

Hydantoins; Preparation of — Chem. Fabr. von Heyden A.-G. Radebeul. Ger. Pat. 310,427, 29.5.14. Addition to Ger. Pats. 309,508 and 310,426 (this J., 1919, 389A).

HYDANTOINS are prepared by condensing compounds of the type $R.R_1C(NH.CO.NH_2).COOH$, $R.R_1C(NH.COOH)CO.NH_2$, and $R.R_1C(NH_2).CO.NH.CO.OH$, where R represents an alkyl group and R_1 an aryl or alkyl group with the exception of methyl and ethyl, either in the presence of a condensing agent, or by heating with or without a solvent or diluent. Several examples are given illustrating the preparation of different members of the series.—L. A. C.

Benzoic acid; Preparation of — by oxidation of toluene with chromic and sulphuric acids. O. Dieffenbach, Darmstadt, and F. Alefeld, Rodach. Ger. Pat. 311,051, 9.12.13.

IN the oxidation of toluene to benzoic acid by means of chromic acid in the presence of sulphuric acid, sulphuric acid of at least 40% strength is used, and the temperature is not allowed to rise above 30° C. With sulphuric acid of 50 to 60% strength and by maintaining the temperature below 30° C., a yield of 60–63% of benzoic acid is obtained; the presence of suitable catalysts, e.g., iron, manganese, or cerium sulphates, hinders oxidation of the nucleus, and the yield is raised to 70 to 73%.—L. A. C.

Tablets for medicinal and similar purposes; Preparation of friable — Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 311,148, 1.9.17.

THE material to be made into tablet form is mixed with finely divided cellulose, or one of its derivatives, which has lost its fibrous structure and has been converted to the amorphous form. For example, 4 parts of acetylsalicylic acid is mixed with 1 part of cellulose hydrate, prepared by treating artificial silk waste with 10% caustic soda, or of acid cellulose, prepared by treating wood cellulose with 50% caustic soda, or of oxycellulose.

—L. A. C.

Hexamethylenetetramine; Manufacture of preparations of addition compounds of iodine and — G. B. Pegram, New York. Eng. Pat. 117,451, 20.6.18. (Appl. 10,211/18.) Int. Conv., 23.6.17.

SEE U.S. Pat. 1,255,335 of 1918; this J., 1918, 223A.

Acetic anhydride and acetaldehyde; Production of — J. Koetschet and M. Beudet, Lyon. Assignors to Soc. Chim. des Usines du Rhône (anc. Gilliard, P. Monnet et Cartier), Paris. U.S. Pat. 1,298,356, 25.3.19. Appl., 11.6.18.

SEE Eng. Pat. 110,906 of 1917; this J., 1918, 282A.

Aliphatic acids containing an arsenoarylamine group. K. J. Oechsli, Paris. U.S. Pats. 1,299,214 and 1,299,215, 1.4.19. Appl., 4.3.15.

SEE Eng. Pats. 17 and 18 of 1915; this J., 1916, 275.

Willow bark. Ger. Pat. 310,545. See V.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Colour values in monochrome and a new viewing filter to assist in obtaining them. F. F. Renwick. Phot. J., 1919, 59, 153—169.

COLOUR-SENSITIVE plates are used for two very different classes of work. In the first, chiefly represented by three-colour processes, separate records are obtained through differently coloured filters

with the object of obtaining coloured reproductions; for these processes a plate which had uniform sensitiveness to the normal spectrum of average daylight would be approximately ideal. In the second class a record in monochrome is required in which the tone values of the original should be preserved in the reproduction; in this case an ideal plate would be one in which the colour sensitiveness corresponds with that of the normal eye. The paper gives a résumé of the results obtained by previous workers in this subject. The curve of sensitiveness of the eye shows a maximum at about $\lambda = 555\mu\mu$ and falls off symmetrically on each side of this point. There is not at present any plate whose colour sensitiveness even approximates to this ideal, so that for correct reproduction in monochrome of coloured objects a correction filter must be used. The colour of the ideal filter for this purpose depends on the actual colour-sensitiveness of the plate used; its absorption curve is the difference between the curve of plate-sensitiveness and that of visual luminosity. If the plate is uniformly sensitive to the spectrum the absorption curve of the filter is the inverse of the luminosity curve; this latter is worked out, for the open arc, from the figures given by Abney, applying corrections to allow for Abney's arbitrary spectrum scale and for the fact that he used a slit of constant width and not of a constant range of wave-lengths. It is not easy by visual inspection alone to estimate correctly the relative tone values of the different parts of a coloured subject or exactly how a colour-sensitive plate with or without a filter, will reproduce it; if however the subject be viewed through a filter of complementary colour to the ideal correction filter the apparent tone-values will be the same as in the reproduction by the plate. If the viewing filter be used in conjunction with a taking filter the appearance is that of the reproduction by the plate through this taking filter. The blue viewing filter described and shown by the author was worked out to correspond as nearly as practicable with this theoretical filter for the Ilford Panchromatic plate.—B. V. S.

Drying [photographic plates and papers] by alcohol. L. P. Clerc. Bull. Soc. Franç. Phot., 1919, 6, 85—91.

A white opalescence occurring on negatives the drying of which was hastened by treatment with spirit was found to be due to precipitation in the film, or between the film and the glass support, of calcium bicarbonate, and to a less extent, of calcium sulphate. The salt was supplied by the washing water, the trouble occurring chiefly in districts where the water supply is very hard. The effect can also be produced by other salts insoluble in alcohol, for example sodium bicarbonate. It may be avoided by washing in salt-free water (distilled or rain-water) before immersion in the spirit bath, but more easily by a short preliminary treatment with a weak solution of hydrochloric, nitric or acetic acid, the calcium salts of these acids being soluble in alcohol. The time taken in drying plates and papers after treatment with spirit is independent of the length of time in the spirit, provided this is enough, about 10 minutes, to allow the attainment of equilibrium between the film and the bath; it varies considerably, however, with the final strength of the spirit bath. Curves are given showing the effect of the strength of the spirit on the time of drying for both plates and papers, the effect being much less in the latter case.—B. V. S.

PATENTS.

Photographic printing paper and transfer processes. Kerotype, Ltd., and T. P. Middleton, London. Eng. Pat. 126,149, 7.5.18. (Appl. 7641/18.)

THE waxed paper support for the transfer process described in Eng. Pats. 29,616/12 and 12,091/15 (this

J., 1914, 221; 1916, 1035) is prepared for coating with the gelatin emulsion by a matt substratum coating obtained from a solution of two resinous substances having different solubilities in mixed solvents. A suitable solution consists of gum sandarac (90 grains) and gum mastic (20 grains) in methylated ether (sp. gr. 0.720, 3 oz.) and methylated spirit (90%, 3 oz.) or in alcohol (90%, 4½ oz.) and anhydrous ethyl acetate (1½ oz.). The waxing, substratum coating and coating with sensitive emulsion may be carried out in one continuous operation, or the last process may be separately carried out. In the apparatus described, the paper, after applying the substratum coating, is dried in a partially exhausted chamber.—B. V. S.

Colour photography. I. Kitsee, Philadelphia, Pa. U.S. Pat. 1,298,514, 25.3.19. Appl., 22.9.16. Renewed 5.2.19.

DIFFERENTLY coloured chromated gelatin films on either side of a suitable support are simultaneously exposed through filters of the same colour as the films.—B. V. S.

[*Photographic*] *transfer process.* F. W. Kent, London, and T. P. Middleton, Farnham, Assignors to Kerotype, Ltd., London. U.S. Pat. 1,299,479, 8.4.19. Appl., 17.6.16.

SEE Eng. Pat. 12,091 of 1915; this J., 1916, 1035.

N-Methyl-p-aminophenol. U.S. Pat. 1,297,685. See III.

XXII.—EXPLOSIVES; MATCHES.

Picric acid and trinitrobenzene; Potential energy of ——. E. von Herz, Z. ges. Schiess- u. Sprengstoffw., 1918, 13, 368—370, 385—386. Chem. Zentr., 1919, 90, II., 294.

THE potential energy of aromatic nitro-hydrocarbons is increased by the introduction of hydroxyl groups: A study of the thermochemical processes involved in the formation and explosive decomposition of picric acid gave results about 44.6 cal. per kilo. higher than in the case of trinitrobenzene. The maximum increase of energy obtainable by hydroxylation is reached with the introduction of one hydroxyl group, whilst the introduction of further groups causes a progressive decrease of energy, owing mainly to the progressively increasing heat of formation of the polyhydric phenols, e.g., trinitro-resorcinol and trinitrophenol. The cause of the increase in energy produced by the hydroxyl group is the primary formation of carbon monoxide from the hydroxyl oxygen and its subsequent oxidation to carbon dioxide, a far greater amount of heat being developed in this oxidation than in the formation of carbon dioxide from the elements.

—C. A. M.

Highly-explosive nitro compounds; Relationship between the explosive force and constitution of ——. A. Stettbacher. Schweiz. Chem.-Zeit., 1919, 1, 95—97.

IN comparative experiments in which from 1½ to 50 grms. of different nitro compounds were exploded over iron plates (3 to 8 mm. in thickness) it was found that, contrary to expectation, compounds containing the methyl-nitro-amino group, such as trinitrophenylmethyl-nitramine, had more explosive power than those containing a hydroxyl group, such as trinitrophenol, whilst aromatic compounds with four nitro groups in the nucleus (e.g. tetranitro-aniline) were still more violent in action. The tetranitro derivatives show complete parallelism with the tri-nitro derivatives. Just as trinitro-aniline (picramine) is less explosive than trinitrophenol, so is tetranitro-aniline weaker than tetranitro-

phenol, and the latter than tetranitrophenylmethyl-nitro-aniline. The superior explosive power of the methyl-nitro-amino group is due to the destabilising influence of the nitramine group as the fifth substituting group in the benzene molecule. Owing to their instability and sensitiveness to shock the tetranitro derivatives (with the possible exception of tetranitro-anisol) are unsuitable for practical purposes. Tetranitro-aniline is more stable than nitro glycerin at 70° C., but at lower temperatures the reverse is the case, and it slowly emits nitrous acid. Trinitro-dimethyldinitro-aminobenzene and trinitromethylnitro-amino-phenol are both powerful explosives, but owing to the cost and trouble of preparing them are not in use.—C. A. M.

Mercury fulminate; By-products in the preparation of —. Langhans. Z. ges. Schiess- u. Sprengstoffw., 1918, 13, 345—349, 389—391, 406. Chem. Zentr., 1919, 90, II., 295.

As a rule an after-reaction takes place in the filtered liquor from the retorts, so that cautious neutralisation is necessary. Fresh liquor is yellowish-green and has an odour of nitric and nitrous acids. At 40° C. it yields 0.15—0.18% of mercury fulminate (0.10—0.12% Hg) per litre in 24 hours. From 1900 to 2000 c.c. of liquor is obtained from 1070 c.c. of nitric acid, 1800 c.c. of alcohol, 1000 c.c. of water, and 150 grms. of mercury. Phenolphthalein should be used as indicator in determining the acidity. An old liquor (650 c.c.) which had been kept for a year in a stoppered vessel in the dark contained no mercurous salt, but 37.5 grms. of metallic mercury, and 7 grms. of impure mercuric oxide (total Hg=0.661%). Liquors obtained by condensation contain mercurous salts, and both kinds of lye contain nitrous acid. The residue obtained on evaporating unneutralised mother liquor consists of 90 to 95% of oxalic acid, the remainder being a mercury compound. Nitrogen compounds are not present. Neutralised liquor contains glycollic acid, nitrates, acetates, and formates.

—C. A. M.

PATENTS.

Nitroglycerin; Manufacture of —. J. G. Baxter, Gravesend. Eng. Pat. 125,091, 6.5.16. (Appl. 6523/16.)

A CYLINDRICAL nitrating vessel is divided into two compartments by an annular wall which permits of communication between the two compartments at top and bottom. Both compartments are provided with cooling coils, and the inner compartment has also air agitation coils. Mixed nitrating acid and glycerin are run continuously in the correct proportions into the inner compartment and pass away through an overflow placed near the top of the outer compartment to a separator which is of such a size that the inflowing stream causes little disturbance. The lower part of the separator is provided with cooling coils, and in the upper part is an observation window. Nitroglycerin is discharged from an opening in the upper part and the waste acid passes away by a pipe reaching to the bottom of the separator and extending to the height of the nitroglycerin outlet. The relative rates of flow of the two liquids are regulated by raising or lowering an india-rubber pipe fitted to the nitroglycerin outlet.

—T. St.

Nitrating, mixing, and similar apparatus; Feed control of —. Nobel's Explosives Co., Ltd., Glasgow, and J. N. Lyall, A. Wilson, J. H. O'Connor, and J. McKillop, Pembrey, Carmarthen. Eng. Pat. 125,094, 9.5.16. (Appl. 6652/16.)

In apparatus where one liquid is run into another liquid which must be kept agitated during the process, means are provided for deflecting the stream of incoming liquid into an overflow tank when the

agitating mechanism is not working. In the case of mechanical stirring, governor balls on the main or a secondary shaft actuate, through a bell-crank lever and a link, a swivelling bend which forms the exit end of the liquid-supply pipe. The amount of liquid passing to the mixing or nitrating tank is thus dependent on the position of the governor. Liquid seals are provided at the supply and delivery ends of the swivel connection to allow of the necessary movement while preventing the escape of harmful fumes. Where agitation is produced by compressed air, the supply pipe is controlled by a piston sliding in a cylinder, the piston being acted upon on one side by a spring and on the other side by the compressed air.—T. St.

Trinitrotoluene and such like bodies; Process for the purification of —. S. Dreyfus, Manchester. Eng. Pat. 125,110, 20.5.16. (Appl. 7203/16.)

A CLOSED cylindrical vessel with valve-controlled inlets and outlets has a conical lower part and is provided with a central tube passing nearly to the bottom. A suitable quantity of trinitrotoluene or similar substance which is to be freed from acid is admitted into the vessel and water under pressure at 100°—120° C., or at atmospheric pressure at 90°—120° C. is then supplied through the central pipe. A continuous current of hot water thus passes upwards through the trinitrotoluene and runs away through an outlet near the top. The purified trinitrotoluene is run or blown off through an outlet at the bottom, the vessel being left filled with the most recently admitted water, and a fresh quantity of trinitrotoluene is admitted through an inlet near the top of the vessel.—T. St.

Trinitrotoluene and other nitro compounds; Process for the washing of —. Chance and Hunt, Ltd., and A. E. Holley, Oldbury, and O. E. Mott, Woolwich. Eng. Pat. 125,140, 10.6.16. (Appl. 8234/16.)

ACID molten trinitrotoluene and water pass in opposite directions through a series of vessels so that the fresh water comes into contact with the nearly finished product. Each vessel contains communicating mixing and separation compartments, and the flow of liquids is brought about entirely by the head produced in the separation compartments, the vessels being at the same level. The general arrangements are similar to those described in Eng. Pat. 124,461/16 (this J., 1919, 390A).—T. St.

Explosives; Manufacture of —. F. G. L. Johnson, London. Eng. Pat. 125,128, 2.6.16. (Appl. 7857/16.)

Mixed ammonium and potassium perchlorates, powdered to pass through a 60-mesh sieve, are added gradually to molten paraffin wax in a suitable mixing machine, to produce an intimate mixture of 82—83% of mixed perchlorates and 18—17% of paraffin wax. The relative proportions of the two perchlorates may vary widely, but good results have been obtained with the mixture:—ammonium perchlorate 41, potassium perchlorate 41, paraffin wax 18%.—T. St.

Picric acid and other products of nitration; Manufacture of —. J. G. Baxter, Gravesend. Eng. Pat. 125,160, 22.6.16. (Appl. 8773/16.)

PHENOLSULPHONIC acid and mixed nitric and sulphuric acids are run continuously in the correct proportions into a mixing vessel in which are cooling coils, and the mixture then passes through a second vessel, provided with obstructions, where nitration is completed. The mixing vessel is divided into inner and outer compartments which communicate at the bottom. The reacting materials are run into the inner compartment, in

which are means for agitation, and the mixture passes under the dividing wall and away to the second vessel by an overflow situated near the top of the outer compartment. The second vessel is provided with a cover over which cold or hot water is poured to control the action.—T. St.

Picric acid; Process for manufacturing —. P. Ramy, London. Eng. Pat. 125,461, 12.8.16. (Appl. 11,411/16.)

NITRE-CAKE and sodium or potassium nitrate are heated to dull redness and the evolved gases are passed through a series of vessels containing heated benzene and a catalyst, picric acid mixed with dinitrophenol and nitrobenzene being formed. The vessels containing benzene are heated by steam to nearly 105° C., and are provided with reflux condensers. The catalyst may consist of metallic silver, copper, or mercury, or their salts, or aluminium salts.—T. St.

Explosives; Propellant —. E. I. du Pont de Nemours and Co., Assignees of A. S. O'Neil, Wilmington, Del., U.S.A. Eng. Pat. 125,482, 9.6.17. (Appl. 8263/17.) Int. Conv., 17.8.16.

GRAINS of colloided nitrocellulose powder are tumbled with a dinitrotoluene (preferably the 1,2,4-isomer) in powder form, and are then heated to melt the dinitrotoluene and thus cause it to adhere to the powder grains. These are then immersed for some hours in hot water to cause the coating to impregnate the grains to an appreciable depth. Camphor or/and diphenylamine may be mixed with the dinitrotoluene to produce a coating of lower melting point.—T. St.

Explosive. F. Howles, Manchester. Eng. Pat. 125,600, 1.9.16. (Appl. 12,404/16.)

PICRIC acid in solution is treated with hydrogen sulphide in the presence of an alkali, preferably ammonia, whereby one nitro group is reduced, and the resulting amino compound, after being separated from the sulphur formed in the reaction, is made into a paste with water and treated with sodium nitrite and hydrochloric, or preferably, nitric acid. The chloride or nitrate of dinitrodiazophenol thus produced, though less sensitive than mercury fulminate, is efficient as a detonator or primer for high-explosive projectiles.—T. St.

Explosives. W. Blackmore, London, R. T. Cooke, Annfield Plain, Durham, and F. W. Jenkins, London. Eng. Pat. 125,663, 18.10.16. (Appl. 14,814/16.)

CLAIM is made for explosives of the perchlorate class which contain both anthracite and carborundum. Examples of suitable explosives of this class are given containing anthracite 0.5 to 4% and carborundum 0.5 to 7%.—T. St.

Noxious or like material [benzyl chloride] for use in operations of war. W. Hill, Birmingham. Eng. Pat. 125,539, 26.8.16. (Appl. 12,095/16.) Addition to Eng. Pat. 8422/15.

BENZYL chloride incorporated with light magnesium carbonate to cause it to remain suspended in the air is incorporated in explosive shells, bombs, or the like.

Explosive. W. Rintoul and E. G. Beckett, Assignors to Nobel's Explosives Co., Ltd., Stevenston, N.B. U.S. Pat. 1,298,793, 1.4.19. Appl., 3.1.19.

See Eng. Pat. 14,706 of 1915; this J., 1919, 340 A.

XXIII.—ANALYSIS.

Viscometers; Standard substances for the calibration of —. E. C. Bingham and R. F. Jackson. Bull. Bureau Standards, 1918, 14, 59—86.

As liquids of greater viscosity than water, solutions of sucrose and mixtures of ethyl alcohol and water are suitable and convenient for use in calibrating viscometers. The viscosities of ethyl alcohol-water mixtures have been determined by several observers, with fairly concordant results, but the accuracy of existing data relating to sucrose solutions has been questioned. The viscosities of 20% and 40% solutions of sucrose (by weight) were determined at temperatures from 0° to 100° C., and that of a 60% solution from 10° to 95° C., with results generally somewhat higher than those obtained hitherto. Existing data relating to the viscosity of water were also reviewed and corrected, the viscosity and fluidity being calculated for every degree from 0° to 100° C. In discussing the relative merits of absolute and specific units for expressing viscosity, the centipoise (cp., the one-hundredth part of the c.g.s. unit) is favourably considered. By the use of this unit the absolute and specific viscosities of a liquid are practically the same, provided that water at 20° C. be taken as the standard. The most probable value for the viscosity of water at 20° C. was found to be 1.005 cp.

—W. E. F. P.

Potash absorption apparatus; Efficiency of —. A new form of helical absorption apparatus. J. Friedrichs. Z. angew. Chem., 1919, 32, 129—132.

ABOUT 60 different types of potash absorption apparatus have been described. A number of the best known of these have been tested and their specific absorption capacity determined, in order to compare their efficiency with that of a new type devised by the author and constructed on the helical principle. This new pattern consists of outer and inner cylindrical vessels with fused connections. The gas enters the inner cylinder which occupies the major portion of the capacity of the outer vessel. It emerges through a hole in the bottom and escapes upwards through the annular space between the two cylinders. A helix is moulded on the outer surface of the inner cylinder in three convolutions in such a way that the apex of the helix does not quite touch the wall of the outer cylinder. The bubbles of gas are thus forced to travel in a spiral path but sufficient clearance is afforded for the free circulation of the liquid. A bent calcium chloride tube is attached by a ground glass joint to the exit orifice of the outer cylinder. The whole apparatus when charged weighs about 38 grms. and contains about 10 c.c. of potash solution. The capacity of the inner vessel is ample to accommodate the whole of this liquid if sucked back. The path traversed by the bubbles of gas is about 25 cm. but the back pressure is only equivalent to about 5 cm.—J. F. B.

Micro-elementary [organic] analysis. E. Müller and H. Willenberg. J. prakt. Chem., 1919, 99, 34—44.

AN apparatus for the elementary analysis of organic substances (benzene, acetanilide, bromobenzene, phthalimide, etc.) is described, from 2 to 5 mgrms. of substance being used for the analysis. The oxygen required for the combustion is obtained by the action of Caro's acid on potassium bichromate; a single burner is used to heat the combustion tube, and the various parts of the apparatus are connected by ground-in joints, rubber connections not being employed.—W. P. S.

Ammonia distillations; Scrubber for —. B. S. Davisson. J. Ind. Eng. Chem., 1919, 11, 465—466.

A STILL-HEAD of the bulb type, the bulb having a

capacity of about 200 c.c., has a tube at the top leading to the condenser, whilst the lower tube, connecting the bulb with the distillation flask, extends upwards into the bulb and is then bent downwards ending in a small perforated bulb. The first steam condenses in the bulb and the condensed water surrounds the perforated bulb and acts as a scrubbing solution for the remaining vapours. The apparatus should be made of "Pyrex" glass to avoid errors due to the extraction of alkali from soft glasses. The use of a bulb adapter on the lower end of the condenser is recommended; the end of this adapter is also provided with a small perforated bulb.—W. P. S.

Ferrous iron; Estimation of — by means of the oxidation potential. I. M. Kolthoff. Chem. Weekblad, 1919, 16, 450—461.

The ferrous solution, acidified with sulphuric or hydrochloric acid, is titrated with a standardised potassium bichromate solution. The E.M.F. between a platinised platinum electrode immersed in the solution and a normal calomel electrode is determined after successive additions of the bichromate solution. The measurements obtained are plotted in a curve against the volume of the titrating solution added. Near the end-point the E.M.F. increases rapidly, the exact end-point being given by the middle point of the nearly vertical curve section. Titration with potassium bromate yields satisfactory results, the end-point being sharper in hydrochloric than in sulphuric acid solution. With potassium permanganate variable readings of the E.M.F. are obtained.—W. S. M.

Platinum and alcohol; Recovery of — from potash determinations. A. E. Smoll. J. Ind. Eng. Chem., 1919, 11, 466—467.

FILTRATES and washings from potassium determinations are collected and distilled until the vapours distil at 100° C.; platinum black and water remain in the distillation flask, whilst the distillate consists of alcohol containing a considerable quantity of aldehyde. To remove aldehyde, the distillate is heated under a reflux condenser through which a current of water at 58° C. is passed; this condenser is connected with an ordinary condenser and the heating is continued until the distilled liquid is free from aldehyde. A sensitive test for aldehyde consists in dissolving a few crystals of phenol in 5 c.c. of concentrated sulphuric acid and then adding 3 c.c. of the distillate; if aldehyde is present, a reddish-brown colour is obtained, otherwise the mixture remains colourless. After the aldehyde has been expelled, the alcoholic solution is treated with sodium hydroxide and distilled until the distillate has a sp. gr. of 0.8045, the alcoholic strength of the solution required for washing potassium chloroplatinate precipitates.—W. P. S.

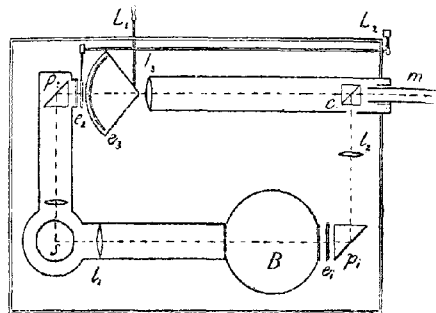
Low temperatures; Measurement of — with thermocouples. T. Spooner. J. Franklin Inst., 1919, 187, 509—510.

TEMPERATURES below 0° C. down to that of liquid air can be measured by copper—"advance" couples. The author has tested the alloys which are called in the trade chrome-alumel but finds no appreciable advantages in this range over the copper—"advance" couple.—W. H. P.

Opacimeter for bacterial estimations. Lambert, Viès, and De Watteville. Comptes rend., 1919, 168, 797—799.

THE apparatus is so constructed that from one source of light, *S*, two beams pass out at right angles, one of which passes through a bath of water, *B*, in which the bacterial suspension, in a containing cell, may be plunged, and then through the colour screen *e*₁, prism, *p*₁, and lens, *l*₂. The

other beam is filtered through a coloured screen, *e*₂, and passes through a photographic film, *e*₃, progressively darkened and arranged to move over a scale. The two beams are then directed through the telescope, *m*, by the prism arrangement, *c*, which is so arranged that the two illuminated fields



adjoin and at the same time the image of the scale of the photographic plate is in the field of vision. This scale is calibrated for each particular type of bacterial suspension to be examined, either in terms of dry weight of bacteria per c.c. of emulsion or in number of bacteria per c.c. By simply moving the photographic plate until the two fields have an equal intensity the concentration of the emulsion may then be read directly from the scale.

Nitrogen in coal and coke. Terres and others. See 11A.

Vegetable fibres. Haller. See V.

Vegetable fibrous materials. Schwalbe. See V.

Arsenic acid. Winkler. See VII.

Boric acid. Jannasch and Noll. See VII.

Sulphur-oxygen compounds. Sander. See VII.

Hydrogen sulphide. Palet and Fernandez. See VII.

Carbon monoxide, dioxide, oxysulphide, etc. Stock and Seelg. See VII.

Carbon in steel. Rogers. See X.

Sulphur in iron and steel. Marinot. See X.

Oxygen in cyanide solutions. White. See X.

Brass ingots. Deakin. See X.

Zirconium ores and alloys. Travers. See X.

Recovering ether in fat determinations. Grossfeld. See XII.

Sulphite-cellulose. Yocum and Nelson. See XV.

Citric acid in milk. Kunz. See XIXA.

Cacao products. Hoepner. See XIXA.

Albuminoid ammonia. Cooper and Heward. See XIXs.

Morphine. Lautenschläger. See XX.

Morphine. Palet. See XX.

Organic bases. Guglielmelli. See XX.

Menthol. Von Friedrichs. See XX.

Alcohols. Béhal. See XX.

Carbonyl chloride. Kling and Schmutz. See XX.

Extractions with ether. Pinnow. See XX.

Patent List.

The dates given in this list are, in the case of Applications for Patents, those of application, and in the case of Complete Specifications accepted, those of the Official Journals in which the acceptance is announced. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the date given.

I.—GENERAL; PLANT; MACHINERY.

APPLICATIONS.

- Aubé. Pulverising apparatus. 14,888. June 12.
 Boake, Roberts, and Co., and Durrans. Still-heads. 13,754. May 30.
 Boberg, and Techno-Chemical Laboratories. Drying. 13,339. May 27.
 Boberg, and Techno-Chemical Laboratories. Drying processes. 14,433. June 6.
 Corbett. Grinding-mills of the rotating-disc type. 14,249. June 5.
 Goubert. Drying substances. 13,367. May 27.
 Hansen. Apparatus for mixing liquids in closed vessels. 14,460. June 6. (Denmark, 21.3.17.)
 Imperial Trust for the Encouragement of Scientific and Industrial Research, and Piqué. Cooling-apparatus. 13,492 and 13,493. May 28.
 Ironside. Crystallisation of salts. 14,995. June 13.
 McIntyre. Centrifugal machine for filtering or extracting liquids, semi-liquids, etc. 13,706. May 30.
 Marks (Fours et Procédés Mathy Soc. Anon.). Apparatus for cooling materials. 14,442. June 6.
 Merz. Treating liquids. 14,097. June 4.
 Merz. Concentrating, drying, etc. 14,098. June 4.
 Naaml. Vennootsch. Brons. 13,350. *See* XIX.
 Orchardson. Hot-air drying apparatus. 14,664. June 10.
 Ransford (Davis). Filters. 14,210. June 4.
 Russell. Evaporating apparatus. 14,278. June 5.
 Tucker. Moulds for casting chemical etc. sticks. 13,871. May 31.
 Union Espagnole de Fabr. d'Engrais, de Produits Chimiques, et de Superphosphates. Centrifugal pumps for acids and corrosive liquids etc. 14,405. June 6. (Spain, 5.6.18.)
 Watson. Apparatus for separating comminuted material in dry state. 15,000. June 14.
 Whitfield. Drying apparatus. 14,816. June 12.
- COMPLETE SPECIFICATIONS ACCEPTED.
- 3593 (1917). Maxted and Ridsdale. Activation of catalysts and contact masses. (127,025.) June 4.
 5089 (1917). Daniel and Bregent. *See* XX.
 6420 (1918). Bowman. Evaporating apparatus. (127,071.) June 4.
 8357 (1918). Rose. Filters and the like. (127,089.) June 4.
 9005 (1918). Kirkham, Hulett, and Chandler, and Hersey. Apparatus for effecting intimate contact between liquids and gases. (127,705.) June 18.
 9195 (1918). Huntington, Heberlein, and Co., Bush, and Burns. Means for separating suspended particles from gases. (127,119.) June 4.
 10,116 (1918). Barbet. *See* XX.
 2331 (1919). Klevits, and Kynoch, Ltd. *See* X.

II.—FUEL; GAS; MINERAL OILS AND WAXES; DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

APPLICATIONS.

- Adams and Adams. Manufacture and use of specific refractory material in coke ovens for resisting the action of volatile alkalis. 14,710 and 14,711. June 11.
 American Linseed Co. Artificial fuel. 13,496. May 28. (U.S., 17.7.17.)
 Andrews and Averill. Treating hydrocarbons. 13,374. May 27.

- Blair, Campbell, and McLean, Blair, and Ferguson. Preparing oxidising gases for removing carbon and sulphur deposits in hydrogen manufacture. 14,713. June 13.
 Campbell. Manufacture of gas. 13,606 and 13,607. May 29.
 Coke and Gas Ovens, Ltd., and Gunderson. Coke and gas ovens. 14,459. June 6.
 Courtoy. Coal washers. 14,817. June 12.
 Gibson and Wyman. Producing enriched water-gas. 13,733. May 30.
 Griggs. 14,942. *See* VII.
 Groundstroem. Gas-producers. 14,475. June 6.
 Lynn and Rambush. Generation and utilisation of water-gas. 14,121. June 4.
 Milton. Gas-producers. 13,225. May 26.
 Raworth (Combustion Rationnelle Soc. Anon.). Combustion of pulverulent fuel. 13,949. June 2.
 Roberts. Coke ovens etc. 14,208. June 4.
 Rousseau. Production of hydrocarbon liquids from carbon. 14,086. June 4. (Fr., 9.9.18.)
 Sauer. Production of decolorising carbon. 1477. June 11.
 Smith. Gas-producers. 14,214. June 4.
 Soc. Franco-Belge de Fours à Coke. Horizontal coking ovens. 13,593. May 29. (Fr., 29.5.18.)
 Steel. Manufacture of fuel from anthracite duff. 14,848. June 12.
 Thompson (Fours et Procédés Mathy Soc. Anon.). Coke ovens. 14,105. June 4.

COMPLETE SPECIFICATIONS ACCEPTED.

- 14,210 (1916). Roth and Vincent. Manufacture of coke. (126,997.) June 4.
 2973 (1917). Comp. Gén. d'Electro-Chimie de Bozel. *See* VII.
 3885 (1917). Hughes and Lovell. Fuel. (127,024.) June 4.
 4103 (1917). Berger. Obtaining fumes or vapours by combustion of mixtures of chemicals. (127,031.) June 4.
 6007 (1917). Harger and Terrey. *See* VII.
 6892 (1917). Bassett. *See* XXIII.
 6361 (1918). Marks (Soc. Anon. Ital. Ansaldo & Co.). Production of gases from water or oil. (127,363.) June 12.
 7315 (1918). Cortesy and Castelli. Distillation of liquid hydrocarbons. (127,690.) June 18.
 8440 (1918). Davis. Treatment of flue gases. (127,695.) June 4.
 9880 (1918). Anderson. *See* VII.
 10,287 (1918). Adam. Purification of coal gas. (127,431.) June 12.
 13,670 (1918). Piette, and Soc. Franco-Belge de Fours à Coke. Coking-ovens. (127,165.) June 4.
 16,503 (1918). Taylor. Artificial fuels. (127,775.) June 18.
 16,711 (1918). Dempster and Ballingall. Plant for manufacture of water gas. (127,179.) June 4.

III.—TAR AND TAR PRODUCTS.

APPLICATIONS.

- Andrews and Averill. 13,374. *See* II.
 Davies and Tcherniac. Reduction of aromatic nitro-compounds. 13,619. May 29.

COMPLETE SPECIFICATIONS ACCEPTED.

- 6097 (1917). Barbet et Fils et Cie. Sulphonation of benzene. (127,614.) June 18.
 7315 (1918). Cortesy and Castelli. *See* II.
 8813 (1918). Wilton. Continuous dehydration and distillation of tar and other liquids. (127,700.) June 18.
 9894 (1918). Rintoul, Thomas, and Nobel's Explosives Co. Preparation of amines. (127,740.) June 18.
 10,260 (1918). Reid. Tar still. (127,133.) June 4.
 5930 (1919). Imrie (Gelgy Soc. Anon.). Manufacture of 2-aminoanthraquinone. (127,223.) June 4.

IV.—COLOURING MATTERS AND DYES.

APPLICATIONS.

Barnett and Morden. Packing of aniline dyes etc. 13,917. June 2.
Brotherton and Co., Ehrhardt, Lloyd, and Smith. Manufacture of azo colouring matters. 14,035. June 4.

COMPLETE SPECIFICATION ACCEPTED.

11,215 (1918). Brotherton, Ehrhardt, and Kay. Manufacture of black sulphur colours. (127,143.) June 4.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

APPLICATIONS.

Aktiebolaget Vaporackumulator, and Ruths. Sulphite boilers. 13,654. May 29.
Dreyfus. Manufacture of solutions of cellulose esters and celluloid-like masses, films, etc. 14,688. June 10. (Fr., 4.3.14.)
Greaves, and Portadown Weaving Co. Retting and drying flax etc. 14,798. June 12.
Griffiths, Nolan, Rintoul, and Nobel's Explosives Co. Manufacture of nitrocellulose plastics and solutions. 14,856 and 14,857. June 12.
Havness. Manufacture of thread of cellulose, paper, etc. 14,784. June 11. (Norway, 22.6.18.)
Hollis and Woodmansey. Cleaning wool etc. 15,007. June 14.
Johnston and Sutherland. Preparing or degumming stalk and leaf fibres. 13,828. May 31.
Kashitani. Treatment of cotton yarn or cloth. 13,529. May 28.
Milne. Stationary digesters etc. used in paper-making etc. 14,028. June 4.
Schlichten. Treating fibre-bearing plants. 14,032. June 4.

COMPLETE SPECIFICATIONS ACCEPTED.

10,793 (1916). Nauton Frères. *See* XIII.
4045 (1917). Huebner. Solutions of cellulose acetate. (127,027.) June 4.
5039 (1917). Cochrane. Production of fabrics having the property of invisibility. (127,301.) June 12.
6099 (1917). Dreyfus. Cellulose acetate compositions. (127,615.) June 18.
7500 (1917). Dreyfus. Cellulose acetate compositions. (127,678.) June 18.
9126 (1918). Dydynski (Gaszynski and Ashour-koff). Separation of fibres from fibrous plant stems. (127,714.) June 18.
12,513 (1918). Courtaulds, Ltd., and Criggall. Squirtling-nozzles for making strips etc. from viscose etc. (127,155.) June 4.
15,244 (1918). Broadhurst, Lambie, Peachey, and United Alkali Co. Manufacture of a substitute for celluloid, leather, etc. (127,481.) June 12.

VI.—BLEACHING; DYEING; PRINTING;

FINISHING.

APPLICATIONS.

Calico Printers' Assoc., Nelson, and Rouse. Printing cotton fabrics. 14,231 and 14,232. June 5.
Cuyck and Kerr. 14,223. *See* XIII.
Gaston and Rushton. Dye jigs. 14,599. June 10.
Mandleberg and Co., and Pilkington. Proofing fabrics. 13,226. May 26.

COMPLETE SPECIFICATION ACCEPTED.

14,147 (1918). Calico Printers' Assoc., and Roberts. Bleaching, dyeing, or similarly treating textile and other fabrics in the open state. (127,474.) June 12.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

APPLICATIONS.

Bergve. Production of alkali sulphides or sulpho-

silicates from silicates. 14,950. June 13. (Norway, 8.7.18.)

Blair, Campbell, and McLean, and others. 14,713. *See* II.

Chrystal. Recovery of ammonia. 13,816. May 31.

Clark. Plants for treating sulphuric acid etc. 13,660. May 29.

Griggs. Apparatus for producing hydrogen. 14,942. June 13.

Hedstrom. Production of compounds of radium. 14,439. June 6.

Hutchinson and Richards. Recovery of soluble nitrogen compounds from solutions. 15,045. June 14.

Ironside. 14,995. *See* I.

Norsk Hydro-Elektrisk Kvaestofaktieselskab. Nitroxylsulphuric acid. 14,958. June 13. (Norway, 9.8.18.)

Riiber. Purification of alkaline chloride solutions. 14,875. June 12.

Union Espagnole. 14,405. *See* I.

Wade (Koppers Co.). Manufacture of ammonium sulphate. 13,757. May 30.

COMPLETE SPECIFICATIONS ACCEPTED.

11,867 (1916). Hulin. Extraction of chlorine. (126,992.) June 4.

2973 (1917). Comp. Gén. d'Electro-Chimie de Bozel. Production of hydrogen. (127,018.) June 4.

4397 (1917). Taylor and Scott. Manufacture of sulphuric acid. (127,047.) June 4.

5857 (1917). Maxted. Production of concentrated nitric acid from ammonia. (127,348.) June 12.

6007 (1917). Harger and Terrey. Treatment or purification of mixtures of hydrogen and carbon monoxide to separate the latter. (127,609.) June 18.

6831 (1917). Morgan. Concentrating sulphuric acid and other liquids. (127,652.) June 18.

7465 (1917). Dawson. Production of Glauber's salt and sulphuric acid solutions from nitre cake etc. (127,677.) June 18.

1559 and 1560 (1918). Cederberg, Backstrom, and Kylberger. Production of ammonia. (127,063 and 127,064.) June 4.

8812 and 10,452 (1918). Wilton. Manufacture of sulphate of ammonia. (127,398.) June 12.

9128 and 9129 (1918). Linder. Manufacture of sulphate of ammonia. (127,715 and 127,716.) June 18.

9888 (1918). Anderson. Recovery of cyanogen compounds and/or sulphur from spent oxide. (127,128.) June 4.

11,379 (1918). Norton Co. Producing crystalline alumina. (118,606.) June 12.

11,531 (1918). Pratt Engineering and Machine Co. Sulphur-burning. (118,097.) June 12.

17,814 (1918). Grayson. Manufacture of sodium nitrite. (127,183.) June 4.

VIII.—GLASS; CERAMICS.

APPLICATIONS.

Adams and Adams. 14,710 and 14,711. *See* II.
Corning Glass Works. Glass. 13,508. May 28. (U.S., 28.5.18.)

Ferguson. Apparatus for making glass. 13,500 and 13,501. May 28.

Hatfield. Working glass. 13,208. May 27.

Musiol. 14,455. *See* XIII.

Riley. Gas-heated glass-melting furnaces. 13,318. May 27.

IX.—BUILDING MATERIALS.

APPLICATIONS.

Clark. Stone composition. 14,584. June 10.
Concrete Construction Co. Building materials etc. 14,750. June 11.

Grönroos. Production of artificial stone or slabs of marble-like appearance. 14,182. June 4.

Lambert. Hardening and preserving impregnable soft woods. 14,789. June 11.
Williams. Effecting colour change in wood. 14,855. June 12.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

APPLICATIONS.

Barfield and Wild. Crucible furnaces. 14,193. June 4.
British Cellulose and Chemical Manufacturing Co., Hotz, and Soller. Coating lead linings or surfaces of vessels or apparatus for use in chemical processes. 15,034. June 14.
British Thomson-Houston Co. (General Electric Co.). Annealing metal sheets. 14,154. June 4.
Coles. Continuous electrolytic production of copper wire. 13,247. May 26.
Commercial Electrolytic Corporation. Compound for cleaning guns etc. 13,372. May 27. (U.S., 21,918.)
Cooke and Tipler. Separating antifriction white metal from bronze cuttings. 14,712. June 11.
Cunningham. Repairing aluminium or its alloys for electro-plating. 14,111. June 4.
Fleuterl. Alloy. 13,860. May 31.
Farmer. Alloy. 14,094. June 4.
Frei and Wurstenberger. Protection of selective corrosion of tubes and machinery parts of copper and copper alloys. 14,001. June 2. (Swiss, 1,618.)
Gaunt, Van Marle, and Gibbons Bros. Furnaces for heat treatment of metals. 14,517. June 7.
Greenley, and Vickers, Ltd. Treatment or production of nickel. 14,357. June 5.
Hardy, Hunt, and Wigglesworth. Furnaces for heat treatment of metal articles. 14,245. June 5.
Hurter. Manufacture of iron and steel. 13,157. May 26.
Jarvis. Manufacture of steel. 14,161. June 4.
Leathart, and Locke, Blackett, and Co. Refining lead. 13,597. May 29.
Marks (Luckenbach Processes, Inc.). Mineral selective agent. 14,332. June 5.
Squire. Utilising blast furnace slag. 14,036. June 4.
Tainton. Roasting ores or concentrates. 14,989. June 13.

COMPLETE SPECIFICATIONS ACCEPTED.

5048 and 6038 (1917). Hadfield. Manufacture of steel. (127,302.) June 12.
6546 and 11,348 (1917). Elmore. Extraction of lead and zinc from their ores. (127,641.) June 18.
7120 (1917). Hyde, Jude, and Belliss and Morcom. Impregnating and coating metals with other metals. (127,664.) June 18.
2970 (1918). Stobie. Electric steel manufacture. (127,066.) June 4.
9028 (1918). Clark, and Edison-Swan Electric Co. Treatment of refractory metals and their alloys. (127,708.) June 18.
9267 (1918). British Thomson-Houston Co. (General Electric Co.). Production of steel alloys and the constituents thereof. (127,415.) June 12.
14,662 (1918). Lea. Rendering castings and other metal articles non-porous. (127,772.) June 18.
15,944 (1918). British Thomson-Houston Co. (General Electric Co.). Electroplating steel articles. (127,177.) June 4.
17,068 (1918). Harvey Gas Furnace Co., and Harvey. Gas furnaces for heating or melting metals. (127,181.) June 4.
18,810 (1918). Mate and Rourke. Furnaces for rendering metal articles non-oxidisable. (127,731.) June 18.
21,542 (1918). Bloxam (Stabiliment Blak. Ing. A. Pouchain). Metallurgical furnaces. (127,206.) June 4.
21,550 (1918). Griggs. Open-hearth and like furnaces. (127,785.) June 18.
2331 (1919). Klevits, and Kynoch, Ltd. Pyro-

meters for measuring the temperature of molten non-ferrous metals. (127,534.) June 12.

XI.—ELECTRO-CHEMISTRY.

APPLICATIONS.

Barfield and Wild. Electric furnaces. 14,192 and 14,879. June 4 and 12.
Coles. 13,247. *See* X.
Greenley, and Vickers, Ltd. Secondary batteries. 14,348. June 5.
Hooydonk. Secondary dry battery. 13,986. June 2.
Lewis. Impregnation of electric cables, transformers, etc., and fibrous material used therein, with insulating medium. 14,033. June 4.
Palmer. Electric storage batteries. 13,485. May 28.
Pouchain. Negative plate for electric batteries. 14,462. June 6.
Pouchain. Negative plate for electric accumulators. 14,463. June 6.

COMPLETE SPECIFICATIONS ACCEPTED.

2970 (1918). Stobie. *See* X.
8162 (1918). Oldham and Oldham. Galvanic batteries. (127,376.) June 12.
10,183 (1918). White (Industrial Electric Furnace Co.). Electric furnaces. (127,131.) June 4.
13,024 (1918). Rondelli. Electric furnaces. (127,458.) June 12.
15,944 (1918). British Thomson-Houston Co. *See* X.

XII.—FATS; OILS; WAXES.

APPLICATIONS.

Pellerin. 13,476. *See* XIX.
Sauer. 14,771. *See* II.
Stevenson. Liquid soap. 13,727. May 30.
Thornber. Manufacture of soaps. 14,263. June 5.
Usines de Kenkelaere Soc. Anon. Presses for oil extraction etc. 14,901. June 12. (Belg., 29,116.)
Whitham. 13,819. *See* XIX.
Withers (National Electric Products, Ltd.) Hydrogenating oils. 14,340. June 5.

COMPLETE SPECIFICATIONS ACCEPTED.

9294 (1918). Soc. Franç. des Glycerines. Distilling glycerine. (123,302.) June 12.
9432 (1918). Soc. Franç. des Glycerines. Distilling glycerine. (125,574.) June 18.
13,097 (1918). Jackson (Twitchell Process Co.). Refining of oils. (127,159.) June 4.
14,537 (1918). Phillips. Extraction of oil from cotton seed. (127,478.) June 12.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

APPLICATIONS.

Bloxam (Durand et Huguenin). 13,356. *See* XX.
Cuyck and Kerr. Manufacture of water-colours, and method of fixing them on fabrics etc. 14,233. June 5.
Koppers Co. Manufacture of paint or varnish and their ingredients. 14,845. June 12. (U.S., 29,618.)
Musiol. Enamels and enamelling. 14,455. June 6.
Niven. Production of paints with metal base. 13,732. May 30.
Schmidt. Writing-inks. 14,768. June 11. (U.S., 25,718.)
Wright. Paints for use as undercoats etc. 14,346. June 5.

COMPLETE SPECIFICATIONS ACCEPTED.

10,793 (1916). Nauton Frères et de Marsac, and Tesse. Coating composition, particularly for aeroplane cloths. (126,989.) June 4.
3275 (1918). Soar. Producing direct permanent natural colour effects by the action of light rays on chemical matter. (127,683.) June 18.

14,022 (1918). Curbishley. Manufacture of lamp-black. (127,770.) June 18.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

APPLICATIONS.

Feldenheimer, Plowman, and Schildrowitz. Manufacture of rubber. 13,992. June 2.
Nielson. Rubber compounds. 13,980. June 2. (U.S., 31.5.18.)

XV.—LEATHER; BONE; HORN; GLUE.

APPLICATION.

Knowles and McArthur. Manufacture of tar-derivative tanning materials. 14,495. June 7.
COMPLETE SPECIFICATION ACCEPTED.

15,244 (1918). Broadhurst and others. *See* V.

XVI.—SOILS; FERTILISERS.

APPLICATIONS.

Dederich. Manufacture of fertilising-material. 13,686. May 30.
Fitzgerald. Utilisation of certain waste products in the manufacture of concentrated fertiliser. 14,412. June 6.
Fry and Wolf. Treatment of seeds. 13,774. May 30.
Thompson (Comp. des Phosphates de Constantine). Mechanical treatment of tricalcic phosphates. 15,026. June 14.

XVII.—SUGARS; STARCHES; GUMS.

APPLICATION.

Sauer. 14,771. *See* II.

XVIII.—FERMENTATION INDUSTRIES.

APPLICATIONS.

Bedford and Rogers. 13,338. *See* XX.
Gnocchi. 13,734. *See* XIX.
Wade (Heuser). Manufacture of alcohol-reduced beverages. 14,218. June 4.
Weygang. Production of fermented liquors. 14,158. June 4.

COMPLETE SPECIFICATION ACCEPTED.

17,193 (1918). Stoll. Manufacture of peroxydase preparations. (120,571.) June 4.

XIX.—FOODS; WATER PURIFICATION; SANITATION.

APPLICATIONS.

Erslav. Adapting oil-cakes etc. to human food. 14,772. June 11. (Holland, 13.6.18.)
Fitzgerald. Utilisation of certain waste products in the manufacture of concentrated foodstuff. 14,412. June 6.
Fry and Wolf. 13,774. *See* XVI.
Gnocchi. Production of yolk-of-egg wines or liquors. 13,734. May 30.
Naaml. Vennootsch. Brons. Drying vegetables etc. 13,350. May 27. (Holland, 13.6.18.)
Pellerin. Manufacture of margarine etc. 13,476. May 28.
Porter and Smythe. Preserving perishable food etc. during storage or transit. 14,000. June 2.
Scanes. Apparatus for testing water. 13,166. May 26.
Vernon. Storage of flour. 14,531. June 7.
Whitham. Manufacture of cocoa and chocolate and treatment of oil seeds for recovering oil and by-products etc. 13,819. May 31.

COMPLETE SPECIFICATIONS ACCEPTED.

12,582 (1917). Linden. Complete treatment of sewage or contaminated liquid. (127,353.) June 12.
6184 and 10,913 (1918). Saint, Saint, and Saint. Manufacture of chocolate. (127,362.) June 12.
8705 (1918). Molassine Co., and de Whalley. Manufacture of food for cattle and other animals. (127,888.) June 12.
8891 (1918). Evers and Watkins. Preservative treatment of fish. (127,404.) June 12.

9744 (1918). Linden. Apparatus for treating sewage. (127,419.) June 12.

10,765 (1918). Ellis and Gardner. Apparatus for producing powders from milk etc. (127,752.) June 18.

13,158 (1918). Terwen and Hoogenhuyze. Manufacture of decolorised, odourless and tasteless albumins from blood. (127,766.) June 18.

16,131 (1918). Beer. Recovery and making cheese of the food matters in whey. (127,484.) June 12.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

APPLICATIONS.

Bedford and Rogers. Manufacture of alcohol. 13,338. May 27.

Bloxam (Durand et Huguenin Soc. Anon.). Manufacture of condensation products from formaldehyde and aromatic derivatives. 13,356. May 27.

Davies and Tcherniac. 13,619. *See* III.

Davies and Tcherniac. Manufacture of alkyl sulphates. 13,620. May 29.

Dreyfus. Manufacture of fatty acid derivatives. 15,033. June 14.

Hedstrom. 14,439. *See* VII.

Imray (Soc. Chem. Industry in Basle). Manufacture of allyl ester of 2-phenylquinoline-4-carboxylic acid. 13,502. May 28.

Soc. Chim. des Usines du Rhône. Manufacture of derivatives of aminobenzoic esters. 13,760—2. May 30. (Fr., 20.6.18.)

Soc. Chim. des Usines du Rhône. Manufacture of mono- and di- β -oxyethylaminophenol derivatives. 13,763. May 30. (Fr., 25.6.18.)

Soc. Chim. des Usines du Rhône. Manufacture of ethereal salts of ethylenic halogenhydrins. 14,549. June 7. (Fr., 26.6.18.)

Soc. Chim. des Usines du Rhône. Manufacture of substituted benzoic esters. 14,550. June 7. (Fr., 26.6.18.)

Taylor. Emulsification of oil of lemon etc. and water. 14,227. June 5.

Thompson (Poulenc Frères). Production of benzoic acid. 13,293. May 2.

COMPLETE SPECIFICATIONS ACCEPTED.

5069 (1917). Daniel and Bregeat. Recovery of ether, alcohol, and acetone from gaseous mixtures. (127,309.) June 12.

10,116 (1918). Barbet et Fils et Cie. Recovery of waste ether and alcohol vapours from the atmosphere of factories etc. (117,259.) June 12.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

APPLICATIONS.

Blount and Payne. Photographic sensitised paper. 13,314. May 27.

Greene and O'Malley. Colour photography. 14,631. June 10.

Larsen. Producing screens for the production of half-tone negatives. 14,990. June 13. (Ger., 29.6.18.)

COMPLETE SPECIFICATION ACCEPTED.

3275 (1918). Soar. *See* XIII.

XXII.—EXPLOSIVES; MATCHES.

COMPLETE SPECIFICATION ACCEPTED.

4219 (1918). British Dyes, Ltd., Turner, and Dean. Treatment of waste acid liquors from explosive works. (127,039.) June 4.

XXIII.—ANALYSIS.

APPLICATION.

Scanes. 13,166. *See* XIX.

COMPLETE SPECIFICATION ACCEPTED.

6892 (1917). Bassett. Detecting the presence of hydrogen in gaseous mixtures. (127,656.) June 18.

ANNUAL REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY.

In 1916 the Publication Committee of the Society decided to issue an Annual Report on the Progress of Applied Chemistry, the object of which should be to present to the chemical technologist a comprehensive and critical survey of progress effected in each branch of the chemical industry. Such success has attended the publication of the admirable reports on pure chemistry issued annually by the Chemical Society that the need for a similar compilation to deal exclusively with the departments of applied chemistry had for some time been very apparent. Although it was realised that the Transactions and Abstracts Section of the Journal of the Society of Chemical Industry provided a valuable and most complete reference book of researches and inventions in the chemical industry, it was nevertheless evident that many advantages would be gained by preparing an annual review of progress effected. The Annual Reports Sub-Committee agreed that these sectional reviews, whilst presenting a comprehensive *résumé* of new work and ideas, should be written in the form of monographs in order to present the individual aspect of the expert compiling each section; and it was further considered advisable to change the contributors from time to time.

Vol. I. of the Report covers progress to the end of 1916, whilst Vol. II., recently published, is divided into about twenty sections, and deals with the period up to the end of 1917. The subjects dealt with, together with the contributors, are given below:—

Plant and Machinery: by J. W. Hinchley, F.I.C.
 Fuel: By J. S. S. Brame, F.I.C.
 Gas, Destructive Distillation, Tar Products: by B. W. Smith, M.Sc., F.I.C.
 Mineral Oil: by W. J. A. Butterfield, M.A., F.I.C.
 Colouring Matters and Dyes: by Gilbert T. Morgan, F.I.C., D.Sc., F.R.S.
 Fibres, Textiles, Cellulose, and Paper: by J. F. Briggs, A.C.G.I.
 Bleaching, Dyeing, Printing, and Finishing: by S. H. Higgins, M.Sc.
 Acids, Alkalis, Salts, etc.: by H. A. Auden, M.Sc., D.Sc.
 Glass, Refractory Materials, Ceramics, and Building Materials: by W. J. Rees, F.I.C.
 Metallurgy of Iron and Steel: by C. O. Bannister, F.I.C., A.R.S.M.
 Metallurgy of Non-Ferrous Metals: by G. Patchin, A.R.S.M.
 Electro-Chemistry: by Arthur J. Hale, B.Sc., F.I.C.
 Oils, Fats, and Waxes: by E. R. Bolton, F.I.C., and Cecil Revis, F.I.C.
 Paints, Pigments, Varnishes, and Resins: by R. S. Morrell, Ph.D., F.I.C.
 Indiarubber, etc.: by H. P. Stevens, M.A., Ph.D., F.I.C.
 Leather and Glue: by Joseph T. Wood, F.I.C.
 Sugars, Starches, and Gums: by T. H. P. Heriot, F.I.C.
 Fermentation Industries: by Arthur R. Ling, F.I.C.
 Water Purification and Sanitation: by S. Rideal, D.Sc., F.I.C.
 Fine Chemicals, Medicinal Substances, and Essential Oils: by Frank Lee Pyman, D.Sc., Ph.D.
 Photographic materials and processes: by B. V. Storr, M.Sc.

Although some time must necessarily elapse before these Reports can reasonably be expected to attain the standard of perfection which the Committee responsible for their compilation has set itself, it should be realised that the two issues

already published represent the result of a vast amount of work, and it is confidently anticipated that industrial chemists will take full advantage of them. The volumes have been well received in the chemical industry, perhaps the greatest tribute paid being a request from the Société de Chimie Industrielle for permission to translate them into French. Suggestions for the improvement of subsequent volumes would be welcomed by the Society, and letters on this subject should be addressed to the Secretary, Dr. Longstaff.

The price of Vol. II. is 4s. 6d. to members, 6s. 6d. to non-members, post free in each case. Orders, accompanied by remittances, should be sent as soon as possible to the Publishers, Messrs. Harrison and Sons, 45, St. Martin's Lane, London, W.C. 2. Copies of Vol. I. may be obtained from the Secretary to the Society, price 3s. to members, 5s. 6d. to non-members.

PHYSICAL CHEMISTRY AND CHEMICAL TECHNOLOGY.

In some quarters it is customary to regard the link between physical and applied chemistry as being very slight, but the truth is that physico-chemical principles are of great significance in relation to many industrial processes. The character and extent of this relationship have lately been the subject of three Cantor lectures delivered by Prof. J. C. Philip at the Royal Society of Arts, in the course of which the bearing of physical chemistry on the chemical and allied industries was discussed.

Prominence was naturally given to matters connected with equilibrium, reaction velocity, and catalysis, and it was shown that the law of mass action, coupled with the principles of thermodynamics, permits a definite formulation of the "yield" obtainable in a chemical reaction, in so far as this depends on changes in the proportions of the reacting substances, in the pressure and in the temperature. The points at issue here were discussed in connexion with the contact process for sulphuric acid manufacture, the synthesis of ammonia, and the water gas equilibrium. In all these cases physico-chemical investigation has made it possible to express quantitatively the influence of the various factors which affect the yield of the desired product.

In regard, for example, to the influence of pressure on the ammonia equilibrium, theoretical considerations show that where the amount of ammonia formed is small, as it is at high temperatures, the volume percentage of ammonia in the equilibrium mixture is proportional to the pressure under which the reaction takes place. In conformity with this it has been found that at 800°C. and 1 atmosphere pressure the volume percentage of ammonia at equilibrium is 0.012, whilst at the same temperature and 30 atmospheres pressure, the value is 0.34, that is, nearly 30 times as great.

From the technical standpoint, a knowledge of the equilibrium conditions, however complete, does not go far enough. The manufacturer desires to know, not only what are the maximum quantities of any desired product obtainable under given conditions of pressure, temperature, and concentration, but also whether these results can be achieved in a reasonably short time. In other words, the rate factor has to be considered, and in relation to this question the systematic study of reaction velocity on physico-chemical lines is of great value.

A higher speed of reaction may be secured by a rise of temperature, but this frequently involves,

as in the case of the sulphuric acid contact process and the ammonia synthesis, an undesirable shift of the equilibrium in the direction of a smaller yield. The other recognised method of increasing the rate of chemical change is the use of catalysts, and the lecturer dealt at considerable length with this topic, showing that in heterogeneous catalysis, to which category most of the technical catalysed reactions belong, the principle of mass action is very often masked by the operation of other factors. In such heterogeneous catalysis, the rate of change appears to be determined by the velocity of some physical process, such as occlusion in the surface layers of the catalyst, and not primarily on the velocity of a purely chemical reaction. Examples of this kind are found in the catalytic combination of inflammable gas and air at hot surfaces, and in the hydrolysis of carbohydrates under the influence of enzymes.

The condition of the catalyst surface in technical heterogeneous catalysis is accordingly to be regarded as a factor of prime importance. The extent to which the activity of a solid catalyst may be affected by its previous history and by the treatment it has received is abundantly evident in connexion with the catalytic influence of nickel in the hydrogenation of oils, and that of platinum in the oxidation of ammonia. In these and other cases, notably the sulphuric acid contact process, certain substances are found to act as "poisons" for the catalyst, and these must be absent if the catalyst is to have a reasonably long life.

Another portion of the lecture course was devoted to the physico-chemical principles governing the absorption of gases and dissolved substances, and in connexion with the solubility of gases in liquids reference was made more especially to the storage of acetylene in acetone under pressure, and to the separation of carbon dioxide and hydrogen sulphide from ammonia in the working up of ammoniacal gas liquor. The features of the absorption (or "sorption") of gases by solids were also brought under review, and the special influence of the surface of the solid in this phenomenon was emphasised. When a gas is taken up by charcoal, the first stage, in which this surface effect ("adsorption") is predominant, has to be distinguished from the subsequent slow penetration of the gas into the interior of the charcoal mass ("absorption").

The phenomenon of adsorption is of significance also in the well-known effect of such materials as charcoal and fullers' earth in removing dissolved substances, notably colouring matters, from solutions. In numerous cases the relation between the concentration of the dissolved substance, (1) in the solution, and (2) on the absorbent solid, can be quantitatively expressed in a so-called adsorption formula, which is found applicable to cases of widely differing character. From this point of view the relation between a dye and an animal or vegetable fibre, the function of charcoal in the refining of raw sugar, and the retention of dissolved substances by soil, were discussed.

In connexion with adsorption, no less than equilibrium, reaction velocity, and catalysis, there are thus many points of contact between physical and applied chemistry. It may indeed fairly be claimed that, as in other branches of the science, so in technology, physical chemistry has contributed in no small degree to the introduction of quantitative, as distinct from qualitative, methods of handling chemical problems. It will be generally admitted that all factors which make for rational interpretation and quantitative control in technical processes are of the highest importance, and on this ground the closer co-operation of physical chemists and practical technologists is eminently desirable.

SOME PRESENT-DAY ASPECTS OF THE PAINT AND VARNISH INDUSTRY WITH SPECIAL REFERENCE TO THE WAR.

A. DE WAELE:

The war has been responsible for many changes in several industries, but in the case of the paint and varnish industry in particular it has produced results which should favourably influence future development. This industry is essentially one in which the inner knowledge of the mechanism of manufacture has not been furthered to a great extent by the help which pure chemistry has lent to its service. It has, however, attained a very considerable degree of perfection by the methods of empiricism. In spite of the practice of the more up-to-date firms to introduce scientific control into the factory, comparatively little progress has resulted which might be directly attributable to the influence of pure scientific research. One need not elaborate on the highly involved chemistry and physics of paint and varnish manufacture to seek a reason for this. The industry is particularly one which calls for a close collaboration between the academic chemist and his works' confrère. The furtherance of our knowledge of many problems relative to an industry which is at once utilitarian and decorative is hindered, however, by the difficulty of bringing together the work of the two schools. The "secrecy" of the industry, and the fact that the financial importance of the majority of the paint and varnish firms does not warrant the establishment of a "research department," such as we know it in many other more purely chemical industries, are mainly responsible for this condition of affairs. Our knowledge of the chemistry of the reactions occurring during the oxidation and "boiling" of drying oils is lamentably small, more attention having been devoted to the constitution of the glycerides in their raw state. In spite of this, however, the technology of the treatment of drying oils has attained a high degree of perfection, and were it possible to place at the disposal of the pure organic chemist such information without jeopardising the trade value of the processes involved, there is little doubt but that a more scientific conception of such reactions would speedily result.

As has been pointed out, the paint and varnish chemist has progressed in his work by an uncanny combination of science and empiricism. An instance of this is to be found in the ready manner in which the exacting demands of the aeroplane industry have been met in so far as paint and varnish products are concerned. With the introduction of the aeroplane as a new weapon in warfare, a problem presented itself which involved several new considerations of the resisting properties of protective surfaces. In the aeroplane we have a structure which moves quickly from a warm to a cold atmosphere, and the rapidity of transition is such that one cannot but assume that at the first entry into the freezing air, the temperature of the body supporting the protective covering must be many degrees higher than that of the protective surface itself. We have thus a case of an extreme mechanical strain on the very thin film of protecting paint or varnish. The importance of the non-failure of such protective coating on such an important part as, for instance, the airscrew cannot be exaggerated. In addition, the centrifugal force acting on the airscrew revolving at high speeds is such that an absolute state of perfection is required in the material of its construction. An important factor in the latter is the efficient protection of the sealing of the laminations of the airscrew against moisture, etc., and in view of the

considerable bending which the propeller undergoes during its rotation, the question of elasticity of the protective film is of paramount importance. The liability of the airscrew to splashing with hot lubricating oil and petrol is also to be noted. In addition to this *resumé* of the necessary properties which protective coatings for airscrews should possess there comes the economic question of speed of output in so far as application is concerned. This brings forward the old-time tenet of the varnish and paint maker to the effect that the antithesis of reliability and durability is rapidity in drying after application.

The authority responsible for the examination of aircraft products used in the war early grasped the nature of the problem which resulted from a demand for high efficiency, and wisely decided to leave the fulfilling of the necessary requirements to the discretion of the manufacturers by specifying the conditions obtaining in use, and, as far as was practicable, refraining from specifying the composition of the products to be manufactured. As a result now of expert inspection by Government technologists, varnishes and paints for aircraft are regularly supplied which efficiently fulfil the exacting requirements referred to above, whilst permitting of a rapidity of output in so far as speed of application is concerned, hitherto considered impossible.

The production of varnishes for the protection of the "dope" on wings has also proved a new and very difficult proposition, necessitating an entire revision of the preconceived ideas on oil varnish, the details of which cannot be discussed in this article. Another interesting problem which has been successfully solved is the production of an acetone-resisting paint for use on parts which come in contact with this solvent on application of the dope. The interest in this product lies in the fact that acetone has been the constituent of most commercial "paint removers."

The question of the shortage of many raw materials is one which has arisen during the present war, but with the exception of the staple raw material linseed oil, modern paint technologists had for some time past placed on a secure foundation their knowledge of the properties and uses of many substitutes for what were previously considered indispensable ingredients. Amongst these may be mentioned white lead and turpentine.

The absolute stoppage of supplies of the basic raw material of the paint maker, to wit linseed oil, for other than purely Governmental work was, however, a serious question to the manufacturers. As an alternative to linseed oil, the paint manufacturers were offered linseed oil fatty acids. Since the characteristic drying of linseed oil to a hard elastic film is intimately dependent on the triglyceride structure of the oil, and early consideration on the paint chemists' part showed the inexpediency of relying on the commercial possibility of synthesising the fatty acids to polybasic esters, it became apparent that an absolute stoppage of the industry was threatened if the problem were not attacked on unorthodox lines. The paint manufacturers therefore formed a Federation, which decided to pool the scientific resources of its members for the solution of the problem of the adaptation of linseed oil fatty acids to paint manufacture. As an outcome of the research undertaken, many hundreds of tons of quite excellent paint have been manufactured from the fatty acids.

To turn now to a more general review of the industry, it may be noted that of late years a distinct change has been taking place in the nature of the products manufactured by the paint firms. I here refer to ordinary paint, a product which is very simply defined as heavily pigmented linseed oil. From time immemorial such a product had

been generally accepted as the standard of a pigmented protective surface, in spite of its general inferiority of properties. The selection of pigments, with a view to employing the optimum of durability, had in recent years occupied the attentions of many of the technological associations. Looking at the results obtained, however, we are struck by the absence of definitiveness of the conclusions arrived at. The fact of the matter is that there is little to be done in attempting by means of the added pigment to modify advantageously the weather resistance of the medium used—raw or boiled linseed oil. One only has to call to mind what one might call the purely accidental composition of linseed oil as a mixture of glycerides of saturated and unsaturated fatty acids and the variety and amount of its soluble and volatile oxidation products to find a reason for this. After all, the oil only serves its purpose as a protective agent during a short intermediate period of its history after application, characterised by that comparatively short period when its increase in weight by oxidation is at or near a maximum. Even at this point it possesses the disadvantages of considerable porosity to air and water and giving off volatile products of an acid nature often reactive with the pigment used in a paint. That indefinite preparation—"boiled" linseed oil is little better. A certain degree of stabilisation of the molecules of unsaturated glycerides has undoubtedly been obtained by slight ring-forming polymerisation obtained during the boiling process, but a considerable impetus to further destructive oxidation has been given by oxygen absorption at an elevated temperature, with the result that disintegration of the protective film occurs if anything earlier than in the case of raw oil.

The improvement and change referred to is in the manufacture of enamels in the place of paints. Enamels are characterised and basically to be distinguished from paints in the greater stability of the medium used, a highly polymerised "stand oil" or lithographic varnish with or without the addition of an elastic weather-resisting varnish being employed. Other characteristics of enamels are the greater degree of fineness of the pigments used, and the greater gloss obtaining in the dry film. For the production of white or light coloured enamels zinc oxide is used as the base on account of its greater degree of fineness. From this there results a high gloss and a very permanent suspension of the pigment during storage, the latter being due to the formation of oil-soluble zinc soap and the presence of zinc oxide mainly in the suspensoid state, a fact which is clearly shown by the tendency of an ether-diluted zinc oxide enamel to pass through a fine filter paper. It being generally recognised that a surface of porcelain-like gloss is one of the important factors in maintaining effective weather resistance of the dried film, it was found that this was only obtainable by causing the degree of pigmentation of the product to be in the nature of half that usually obtaining in oil paints. This, and the relatively lower opacity of zinc oxide as compared to white lead, results in considerably less body or opacity being obtained in enamels. This shortcoming, however, is rectified by the employment of undercoatings of high opacity but lower degree of elasticity, impermeability, and resistance to weather than the final coat. The two latter factors do not adversely affect the general structural excellence of the whole coating, whilst the former has been shown in practice to be an actual advantage.

A class of preparation which, as the basis of protective coatings, bids fair to become a serious competitor of oil products, is the so-called flexible pyroxilin. This has for many years past been used as a substitute for the oil basis in artificial leather cloth under a registered trade name. A solution

of cellulose nitrate in solvents of comparatively high boiling-point was mixed with a substance conferring flexibility such as castor oil, nitrated castor oil, etc., the proportion of the latter being such that flexibility and chemical stabilisation were given to the unstable and inelastic film of cellulose nitrate without any of the properties of castor oil as a liquid becoming apparent. The stability of castor oil to atmospheric oxidation and its apparent inhibiting effect on the spontaneous decomposition of cellulose nitrate, rendered it particularly adaptable as the agent for securing that degree of elasticity which would allow of the film obtained comparing with an oil varnish film. Owing, however, to the necessarily low content of total solids in the solution which would allow of a working viscosity being obtained, the film yielded on evaporation is so thin that for most decorative purposes the product would not replace oil varnishes satisfactorily. Moreover, much development is needed before the cost of the raw materials used would allow of serious commercial competition with oil varnishes.

It is probable that the future developments of the paint and varnish industry will lie firstly in the direction of internal improvements in manufacture and economisation of time in the present-day lengthy processes. An appreciation of the fact that linseed oil is by no means the ideal oil to employ when accurately controlled processes are involved and more perfect and exact results are required, will lead to a more extensive investigation of the properties of oils of "simple" glyceridic structure, such as China wood oil. The recent discovery of "Olfidea" oil (Bolton and Revis, this J., 1918, 430 A) shows promise of the possibility of utilising an oil possessing the "pure glyceridic" properties of China wood oil to an even greater degree.

CHEMISTRY AT THE INDIAN INSTITUTE OF SCIENCE, BANGALORE.

The appendix to the ninth annual report of the council of the Indian Institute of Science at Bangalore (1918), contains a summary of the work carried out in pure and applied chemistry during the past session. The following information has been derived from this source.

Department of Applied Chemistry.

The chemical and bacteriological study of the fermentative production of acetone from grain has been continued, and the subjects investigated include: Analytical methods for determining carbohydrate, limits of inflammability of acetone vapour and air, purification of acetone, densities of butyl alcohol mixed with water, treatment of waste products. The bacteriological work was mainly directed to discovering the best means of ensuring sterility in the large scale fermentation, and with maintaining cultures of maximum efficiency.

The occurrence of starch, tannin, latex and sugars in mahua flowers (*Bassia latifolia*) has been investigated. The cane-sugar content increases till the flowers drop, and may reach 28.8 per cent. of the weight of dry flowers. The presence of α -dextrose, levulose, maltose, pentoses and cellulose has been confirmed, but whether practicable quantities of cane sugar can be obtained has not yet been decided. The analytical results show that in the growing stage levulose is always present in greater amount than dextrose; in the final stage the quantities approximate but do not become equal. The following enzymes have been detected during growth: invertase, cytochrome, pectase, amylase, oxidase, catalase, maltase. The production of alcohol from the flowers has been studied, and a 60 per cent. yield obtained.

Fermentation studies have included the investigation of the acetic fermentation of mahua syrup, with a view to increasing the yield. To isolate calcium acetate, the fermented liquor was neutralised with calcium carbonate, but the organism did not resist a concentration of more than 2 per cent., and the calcium acetate solution could not be evaporated economically.

A flannel-like pellicle was observed when *Mycoderma aceti* was grown on a medium containing custard apple juice; its formation does not occur when other media, such as cane sugar or glucose, are used, and appears to be dependent upon the presence of pectose.

The problem of isolating a pure lactic acid bacillus, for the commercial preparation of the acid, has proved complicated owing to the vitality of sporing organisms in India, but some success has been achieved.

Good progress has been made in obtaining the dye from red sanders wood in a powdered form convenient for use, and actual dyeing trials have given encouraging results. Experiments have been made in the extraction of yellow colouring matter from *Butea frondosa* flowers, and annatto from the seeds of *Bixa orellana*.

Much work has been done on the recovery of lac from stick lac by solvents. The use of butyl alcohol as a solvent instead of ordinary alcohol appears to offer no advantages. A variety of lac with a very low melting point was prepared, which could be admixed in any proportion with ordinary lac to obtain products of varying plasticity and melting point. Successful trials were made of this material as a basis for felting cheap fibres.

The experimental soap plant of the Mysore Government has been transferred to a new factory at Bangalore where work was commenced in February, 1918. Methods of soap analysis and production are being studied.

As a result of research work on the production of glue and gelatin from bones and sinews, a large-scale plant is being erected for this purpose near Bombay.

A considerable number of forest products have been investigated, and in particular samples of bark, twigs and wood from certain trees suitable for the growth of lac have been examined together with their associated gums.

Research on activated sludge has been carried out since November, 1917. At a small experimental plant for dealing with sewage erected outside the Applied Chemistry Department, data have been obtained for the construction of the larger installation at Sakchi and also valuable information concerning the character of the sludge under different conditions from the point of view of its use as a fertiliser.

Other investigations included: The determination of the solubilities of potassium and sodium carbonates in presence of each other with a view to the working up of naturally occurring salts; experiments on the refining and bleaching of native bees' wax for the Government of Mysore; a preliminary investigation of the cause of deterioration of paper, for the Imperial Librarian; and the examination of various mineral products.

Department of General and Organic Chemistry.

A. Pure chemistry. V. K. Bhagvat has completed a series of experiments, started in 1912, which show that the esters of strong acids such as oxalic and pyruvic undergo alcoholysis in the absence of a catalyst much more readily than the esters of feeble acids.

In a study of the action of alkalis on the isomeric phenyltribromopropionic acids and their esters, P. Ramaswamy Iyer has shown that the $\alpha\alpha\beta$ acid loses hydrogen bromide more readily than the $\alpha\beta\beta$ acid and that the two acids yield different amounts

of the stereoisomeric dibromo-cinnamic acids. The results of a research on the determination of vapour pressures of concentrated solutions of alkalis and salts and of acetone, by G. R. Paranjpe, have been published in the Institute Journal (vol. 2, part V.). Preliminary experiments by the same author on the occlusion of gases by quartz at low temperatures indicate that at the temperature of liquid air, oxygen and nitrogen are occluded but that hydrogen is not.

B. Technical work. Samples of sandalwood oil have been regularly analysed for the Mysore Government; and samples of wood from the Coimbatore District, sent by the Madras Forest Department, have been distilled, one sample yielding 8 per cent. of oil. A method of refining the dark coloured oil has yielded a product of excellent colour and good quality; 1800 lb. of oil has been distilled.

The chemical examination of the oleoresins from *Dipterocarpus indicus* and from *Hardwickia pinnata* has been completed (Instit. Jour., vol. 2, parts III. and IV.), and samples tested therapeutically in the Campbell Hospital, Calcutta, show encouraging results.

The production of thymol from Ajwan seed has been studied from the point of view of simplifying the process and of obtaining a colourless product equal to that previously manufactured in Germany. The experiments led to successful results, about 1 cwt. of colourless thymol crystals being obtained and sold at about 30s. 8d. per lb. Manufacture by this process has been started by Lakhami at Sind.

A small quantity of cardamom seed oil prepared and sent to London has been reported as of excellent quality, and 55 lb. has been ordered.

A report on wood distillation has been submitted to the Indian Munitions Board. Trials are being continued with an electrically-heated retort holding 100 lb. of wood.

Methods of manufacturing high-grade glycerin have been reported upon, and experiments have been made on the castor seed lipase method of production. A pale yellow crude glycerin containing 37 per cent. of glycerol and 1.15 per cent. total solids has been obtained.

Experiments have been made on electrolytic and quick chemical methods of manufacture. Electrolytic methods are not suitable for India.

Investigations undertaken at the request of the Munitions Board to determine the comparative results of refrigeration and of scrubbing at 35° C. the gases produced during the distillation of acetone, showed that refrigeration was not necessary, as at 35° an 85 per cent. recovery of the acetone vapour can be effected by means of a simple scrubber.

Experiments on the manufacture of straw boards from lantana and bamboo fibres showed that with lantana alone the boards are too brittle. The common bamboo yields good quality boards, and those obtained from a mixture of the two fibres are of fairly good quality. An experimental factory has already been started.

Excellent emery wheels have been made from Mysore corundum in a matrix of magnesium oxychloride. Investigations on the concentration of chrome iron ore and on the elimination of iron from Mysore pyrites have so far not given satisfactory results. A qualitative method for detecting the drug ganja has been devised. Benzene and toluene have been isolated from the oil known as "hydrocarbon" (Instit. Jour. vol. 2, part VI.).

In addition to the work recorded above medicinal preparations have been made for the Madras Government Medical Stores, many analyses and assays have been carried out, and reports issued on a variety of subjects. (See also this J., 1918, 106 n, 193 n).

NEWS FROM THE SECTIONS.

NEWCASTLE.

The Newcastle Section held its December meeting on the 18th. Prof. P. P. Bedson was in the chair.

After a vote of thanks had been accorded to Dr. Budde for allowing the members of the Section to visit the Hendon Paper Works, Sunderland, it was announced that a series of lectures had been arranged for February 19 and 23, March 5, 12, and 19, by Dr. J. W. Mellor, on "Refractory Materials."

A paper was then read by Mr. D. W. Jones on "Notes on the Wet Extraction of Copper." In former days the residue from pyrites burning was usually smelted in a blast furnace in order to recover the copper which it contained (4 per cent.). A Mr. Henderson, however, introduced the idea of roasting the cinders with salt, subsequently extracting the copper by leaching with water, and precipitating it with scrap iron. By this method much of the silver and gold could also be removed in a payable form by precipitation with an iodide. The "grist" or grinding of the cinders is of importance for ensuring proper percolation. Adequate control of the unburnt sulphur in the cinders repaid any amount of trouble; a good figure to work to was 45 per cent. sulphur. The usual hand-rabbed type of roasting furnace was described, and also the more modern mechanical furnaces, such as the Wedge, MacDongall, and Ramen-Beskow, these latter showing a considerable saving in fuel.

In describing the extraction of the gold, the author showed how important a part chemical control played in obtaining good recovery. He then referred to the large amounts of sodium, zinc, and iron salts which were wasted in the effluent, and to the attempts made to recover them.

In replying to the discussion, Mr. Jones said that selenium was entirely volatilised in the calcination, but in leaching, without previous calcination, it found its way into the copper. The copper precipitate produced generally contained about 78 per cent. of metal, and the arsenic precipitated with the copper was easily removed in the smelting. In the freshly burnt material the sulphur in the cinders existed as sulphide, but, after weathering, as sulphate. A preliminary roasting would be beneficial, but not profitable. The method of removing arsenic by partially neutralising the leach liquors with alkali was not in use now. He did not think that brass ash tailings could be profitably treated by this method. The quantity of cinders treated by Germany and this country would be about two million tons 18 years ago; he could not give later figures. The permissible amount of copper in the treated and de-copperised ore would be from 0 to 0.25 or even 0.4 per cent., the presence of copper in iron or steel being now regarded with favour. Nitre cake was helpful from a chemical, but not from a mechanical point of view.

YORKSHIRE.

At the third meeting of the session, held at Leeds, on December 16, Dr. Dufton gave a paper on "Limits of Separation by Fractional Distillation: A New Still Head." The paper, which is not intended for present publication, was replete with details and records of experimental results. The characteristic feature of the new still head is that it is so constructed that there is an annular space between the outer and inner tubes, with a spiral wire round the inner tube, serving the double purpose of holding it in position and providing a pathway for the descending liquor, which does not mix with the ascending vapours. In his general observations, Dr. Dufton said that chemists of the

past had been rather obsessed by the gigantic size of the commercial still, and had given up as hopeless the problem of making a perfect still. In other words, they had been content with a very modest sort of separation when, if they had had a little more confidence, and had given more attention to the efficiency of their apparatus, they might have produced pure products straight away. It had been thought that the separation of a chemically-pure benzene from a mixture of benzene and toluene was quite a hopeless task, but really it was not so; and at the close of his address the author gave a demonstration of the direct separation by distillation of pure benzene from a mixture of benzene and toluene.

In replying to a vote of thanks, Dr. Dufton said he wished to suggest that it might be much cheaper in commercial practice to build the still head on the conical system with condensation all the way up. He wanted to see a commercial still head which would yield benzol, toluol and xylol in such a way that they could be run off at different taps, and he was convinced that the scientific plan was to cool all the way up.

A short note was submitted by Mr. C. A. King on a piece of apparatus devised for the continuous testing of gases. A current of gas is led upwards through a small absorption chamber having projections on the inner walls, to effect more efficient contact with a solution of a suitable indicator which is caused to trickle slowly down the chamber. The indicator solution flows into and out of the absorption chamber through "U" shaped tubes, and forms liquid lutes against the pressure of gas in the apparatus. The outlet tube also acts as an observation tube, in which the colour of the indicator after contact with the gas is noted, and thereby the presence or absence of traces of ammonia in the gas can be immediately observed. The use of a similar form of apparatus is suggested for the detection of other constituents in gases, though obviously only where a colorimetric test may be applied.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The 21st meeting of the Society was held in the University of Sheffield on December 18. Mr. W. F. J. Wood, the president, was in the chair.

A paper was read by Mr. S. English on "An Apparatus for the Accurate Calibration of Burette Tubes." The method employed is based on that for the pipette (this J., 1918, 718 A), since it involves the use of a standardised pipette of precisely known volume and time of drainage. Both the burette and the standard pipette into which it drains are filled with water, and in order to calibrate under the same conditions as obtain in ordinary use, water is placed above the mercury level in the burette. This meniscus is viewed through a telescope attached to a cathetometer and a needle is made to produce a mark on the burette precisely at the level of the meniscus. The author stated that a burette could be calibrated in five minutes, and the accuracy was far greater than was usually observed in calibrating these instruments.

Dr. Turner then gave an address on "Bottle Glass and Glass Bottle Manufacture." In regard to quality he pointed out that it was useless to produce a bottle if the glass of which it was made was unsuitable for contact with the material it was intended to hold. Medical bottles in particular should be subjected to tests in order to ascertain that they conformed to a certain standard. One test was suggested in which solutions of the

alkaloids and mercury solutions were kept in contact with the bottle for 24 hours and the absence or production of a sediment noted. The results of heating a number of different types of bottle in contact with water and steam under pressure were also described and tabulated, and emphasis was laid on the necessity of avoiding excessive use of soda ash in melts. In the case of bottles made from sand, soda ash, and lime spar, it was pointed out that lime spar should not fall below 7 to 8 per cent. of the batch mixture, otherwise the glass was acted on by water to a marked extent.

The lecturer also dealt with the problem of workability, both from the point of view of hand working and machine working. The effects of different constituents present in bottle glass were discussed and described, and the importance of arranging a batch so that the resulting glass should set quickly was emphasised, if production at a rapid rate were desired. The limits of workability for glasses containing sand and soda with either lime, magnesia, or alumina were set out.

WEST OF SCOTLAND IRON AND STEEL INSTITUTE.

Mr. Cosmo Johns read a paper entitled "The Solid and Liquid States of Steel" at the third meeting of the session, held on December 20 last, in Glasgow. The lecturer, having described the surface phenomena of liquid steel as it flows from the launder of an open hearth furnace, proceeded to point out that the laws governing surface tension applied to the samples of steel taken from the bath of the furnace, and showed that the differences in surface tension observed were governed by the amount of occluded gases present. He then emphasised the necessity for studying the heating curves of a quenched steel, explained the effect of uniform as contrasted with non-uniform pressure in depressing transformation points, and, finally, expounded the modern view which postulates the actual fusion of a small portion of any solid (with steel as a striking example) when it undergoes deformation.

INSTITUTE OF CHEMISTRY.

At a meeting of the Council held on December 20, 1918, 3 Students were admitted, and 23 new Associates and 6 new Fellows were elected.

Amongst other business the Council decided to address a circular letter to Local Government authorities recommending, in view of the prevailing economic conditions, a revision of the terms of the appointments of Public Analysts and of Official Agricultural Analysts. It was also decided that a meeting of Public Analysts should be held at the Institute to consider their position in relation to the Committee of the Local Government Board, which has now under consideration the question of the superannuation of Local Government officers.

The meeting discussed preliminary arrangements with regard to the election of the new Council. The following officers and members of the Council retire at the next annual general meeting (March 3, 1919):—Vice-presidents: Mr. H. Ballantyne and Dr. A. Harden. Members of Council: Mr. C. O. Bannister, Mr. H. C. H. Candy, Prof. G. G. Henderson, Prof. P. H. Kirkaldy, Dr. A. Lauder, Prof. G. T. Morgan, Mr. D. Northall-Laurie, Mr. G. Stubbs, and Mr. T. Tickle. The new method for the election of the Council, which is now under consideration, will not come into operation until 1920 owing to the circumstance that it must first be incorporated in the by-laws and approved by the Privy Council.

NEWS AND NOTES

CANADA.

Lyons Fair.—The Minister of Trade and Commerce of the Dominion of Canada has applied for thirty booths at the Lyons Fair, which will be opened on March 1, 1919, and continue for two weeks. A few of the booths will be used for a general Government exhibit of agriculture, forestry and fisheries, minerals and metals, but most of them will be placed at the disposal of the Canadian Manufacturers' Association for allotment to manufacturers for a display of samples and catalogues or photographs of articles which will be available for exportation to France.

Munition Workers as Miners.—The Government has sent out notices to mine managers in Northern Ontario asking them to absorb as many as possible of the men released from the munition plants. During recent months the mines of Northern Ontario have been worked with a deficiency in numbers of about ten per cent., but with the present prospect of a surplus of labour to draw from there should not only be an increased output but the net earnings should also grow.

Removal of Excise on Industrial Alcohol.—A recommendation from the Honorary Advisory Council for Scientific and Industrial Research has been sent to the Dominion Government that the excise on alcohol for industrial purposes should be taken off, and that the Government should buy from the distillers all the alcohol to be used in the industry. It is suggested that the Government should then re-sell this alcohol, at a slight advance, to every firm using alcohol for industrial purposes, and that any firm using ethyl alcohol for industrial purposes should be licensed to that end, a monthly report being made to the Government of the amount consumed. It was also recommended that ethyl alcohol should be allowed duty free to hospitals and university and college laboratories for teaching and research purposes.

Research Institute for Canada.—The Dominion Government has been asked to make a grant of \$700,000 towards the erection of a central research institute, to be allocated as follows: \$500,000 for the building; \$100,000 for apparatus; \$100,000 for salaries. It will probably be located at Ottawa. This is a further development of the idea of assisting industrial research in Canada by the formation of Trade Guilds. As planned at present, each Trade Guild will pay the salaries of its own workers, and the Dominion Government will supply the facilities for carrying on the work of research.

Anniversary Meeting of the Royal Canadian Institute.—On the occasion of the seventy-first anniversary of the founding of the Royal Canadian Institute, held in Toronto on November 23, 1918, Dr. W. S. Stratton, Director of the United States Bureau of Standards, gave an address on the work of the Bureau, which is in reality an industrial research institution, organised under the general departments of Chemistry, Physics and Electricity. Dr. Stratton's address was designed to stimulate the faith of industrial research workers in the value of their work.

Organisation of Canadian Chemists.—The work of the Committee appointed at the Convention of Canadian Chemists held in Ottawa last May has met with a favourable reception. The chemists of every province in Canada are represented on this committee, and their general aim is to obtain legislation from the Dominion Government recognising the professional status of industrial and academic chemists. The feeling is that this will greatly benefit the chemical profession, and at the same time place qualified men in charge of all chemical

work. In Canada, as elsewhere, the public has not yet learned to distinguish between the chemist who is an industrial or professional man, and the chemist who is a druggist or pharmacist.

UNITED STATES.

Award of the John Scott Legacy Medal and Premium.—The City of Philadelphia, acting on the recommendation of the Franklin Institute, recently awarded the John Scott Legacy Medal and Premium to E. J. Sweetland, of Upper Montclair, N.J., for the Sweetland Filter Press. This invention is to provide a self-dumping filter press, which will reduce to a minimum the labour involved in discharging the solid residue left in the press after filtration, and also the labour of cleaning the press by hand.

Physiological Action of Mustard Gas.—A research by Dr. G. H. A. Clowes has yielded results indicating the action of mustard gas on the live cell. Substances soluble only in the aqueous phase cannot penetrate the cell, but mustard gas is fat or lipid soluble and so enters the cell before it is hydrolysed. Within the cell hydrolysis takes place, forming hydrochloric acid, and it is the destruction of large numbers of cells by this acid which produces the characteristic mustard gas burn. The experiments were made with marine organisms.

Candelilla Wax.—In the continued search for sources of potash it has been found that the candelilla plant after wax extraction may be burned to an ash which yields a high percentage of potash. In fact the candelilla contains more potash than any other plant thus far examined. It grows in great quantities in Mexico and Texas and has lately attracted much attention because of the excellent wax obtained from it.

The Zinc Industry.—A series of instructive pamphlets has been prepared by the New Jersey Zinc Co. for free distribution dealing with the composition and uses of zinc dust, pigments, rolled zinc, spelter and other zinc products. The zinc industry is faced with at least two important problems: greater efficiency in roasting the ore and new uses for zinc. Work begun on these lines just prior to the war will undoubtedly be resumed again soon.

Artificial Leather.—One of the more promising artificial leathers, still in the experimental stage, makes use of cotton batting treated with a special rubber solution. One of the fundamental advantages lies in the absence of direction of weave or pattern in this base material, the interlarded fibres imparting strength and giving a foundation for the finished leather not unlike the texture of animal tissue.

Saccharin as a Substitute for Sugar.—The harmlessness of the use of saccharin as a flavouring agent and its worthlessness as a provider of energy are facts which have been fully established on many occasions, but the question of its stimulatory action on the oxidation processes in the body has hitherto received little attention. In this connexion W. E. Burge has communicated to *Science* (Nov. 29, 1918) the results of experiments conducted by him to find out if the ingestion of saccharin produces an increase in catalase (the enzyme which liberates oxygen from hydrogen peroxide, an action which Burge and Neill found to increase when sugar and other foods are ingested), and hence an increase in oxidation in the body. The main result was that saccharin produces a much greater increase than sugar, and the conclusion is therefore drawn that saccharin is a positively helpful element of diet, particularly in a disease such as diabetes where the principal trouble is defective oxidation. The experiments were performed on dogs.